A REGIMENT for the Sea:

Containing very neceſſary matters for all ſorts of men and travailers:

Whereunto is added an Hydrographicall diſcourſe, touching the fiue ſeverall *Paſſages into Cattay.*

Written by *William Borne.*

Whereunto is added a new Regiment, a Table of *Declination*, the *Mariners Guide*, with a perfect Sea *Card* thereto belonging, by *Thomas Hood* D. in Phiſicke. Newly corrected this yeare 1631.

AT LONDON
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septemb: xxij mdclx:

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FINIS.

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To the Reader.

COurteous Reader, I haue thought it good now in this Impreſſion to amend or correct certaine faults that were in the firſt, but moſt ſpeciallie in the ſecond Impreſſion: for that it was printed the ſecond time, I not knowing thereof, ſo that it had not onely thoſe faults that were printed out of the firſt written copie, but now a number of new faults, more than that it had in the firſt: wherefore I haue not onely mended and corrected thoſe faults, but in like manner I haue added other neceſſary matters, not before this time printed, as this: What Eccentricity is, and alſo what Parallax is, and his vſe, as it doth appeare in the firſt folio of the booke. And alſo I haue in like manner ſhewed how that Sea-men ſhould know when that the Moone is in her ſlow and ſwift motion, which is known by the Prime, as it is declared in the third Chapter. And alſo how for to know the Moones Latitude, as it is ſhewed in the fourth Chapter. And alſo I doe ſhew vnto the fifth Chapter, the cauſe that there is more daies frō the Equinoctial of March vnto the Equinoctiall of September, then there is from the Equinoctiall of September vnto the Equinoctiall of March. And alſo I haue added vnto the tenth Chapter, certaine matters touching diſcoueries vnto the North parts. And furthermore, I haue ſhewed in the fourteenth Chapter, how for to know how faſt or ſoftly that any Ship doth goe, and how for to keepe a perfect account of the ſhips way. And alſo I haue altered cleane the ſeuenteenth Chapter and ſhewed how that the ſea-men ſhal know what part or quantity that they haue paſſed or gone of the whole earth; whereby that they ſhould know the diuerſitie of aſpects, as the Eclipſes of the Moone, and the alteration of time, and alſo I haue added diuers things in ſundry places of the Booke, that I doe omitte for breuety. And in like manner I haue added vnto the end of the booke an hydro-

A graphicall

graphicall diſcourſe for to goe vnto Cattay fiue ſeuerall or ſundrie wayes, that is to ſay, the firſt way is about by Cape bone ſperence, which is that way that the Portugals goe vnto Calicut, and vnto the Moluccas, and other places in the Eaſt Indies: The ſecond way is through the ſtraits of Magelane, into the South ſea. The third way is towards the Northweſt, whereas Captaine Frobiſher and Chriſtopher Hall, hath begunne the diſcouery now called Meta Incognita. And the fourth way is by the Northeaſt by the coaſt of Noua Zembla, that Maſter Stephen of Boroſe hath begunne that diſcouery. And the fifth way is by the North Pole, if that it be Nauigable, &c.

Now it is poſſible that I may bee enuied of diuers and ſundry people, for that I haue written this diſcourſe of the paſſages vnto Cattay, for that the nature of a number of men is, to diſlike of all things not done by themſelues: But notwithſtanding al is one vnto me, whether they doe like or diſlike. For that I doe know ſome perſons haue already made euill report of that I haue written before this time, yet notwithſtãding I will not ſtay my pen for their malice: for although their ſkill is much more then mine, my meaning is not to teach any of them, but to inſtruct the ſimpleſt ſort of ſeamen, and to ſhew vnto them ſuch things as are neceſſary for them for to know And alſo ſome ſort of people are of that nature, if that the write or talke of any things paſt their capacitie, then they will ſay that hee can talke well, but they themſelues cannot talke, but they can doe but this is the truth, whatſoeuer he be that will ſay that he can doe any thing, and if that hee cannot ſhew the reaſon of the doing thereof, I doe ſay vnto you he cannot doe it, and this is moſt certaine, for if that he doth it, he doth it but by fortune, euen as he that drew his bow by chance in the Aſſyrians hoaſt, and ſlew Achab the king of Iſrael, as wee doe read in the third booke of the kings, and the laſt Chapter, when that Ioſaphat the king of Iuda, and Achab King of Iſrael, went to battaile againſt Ramoth in Gilead.

For

To the Reader.

For this is generall amongſt Sea-men and alſo Gunners, how ſimple or without ſkill ſoeuer that they be, if that they haue once taken charge to be the maſter of a Ship hee thinketh great ſcorne to learne at any mans hand, but will bragge of himſelfe how long hee hath beene a Maſter, and God knoweth vtterly without ſkill, but that he is a Coaſter, and doth knowe the markes for to carry a Ship ouer the Lands end, and ouer the Naaſe.

But good ſimple men, if that they could not doe that, then there were nothing in them: For euery man muſt needs be skilfull and know that place, that a number of times hee hath occupied, and hath bin taught vnto him.

And who doubteth but a ſimple Fiſherman of Barking, knoweth Barking Creeke, better than the beſt Nauigator or maſter in this land: ſo who doubteth, but theſe ſimple men doe know their owne places at home: But if they ſhoulde come out of the Ocean Sea to ſeeke our Channell, to come vnto the Riuer of Thames, I am of that opinion, that a number of them doth but grope as a blinde man doth and if that they doe hit well, that it is but by chance, and not by any cuning that is in them.

But I doe hope that in theſe daies, that the knowledge of the Maſters of Ships is very well mended, for I haue knowen within theſe 20. yeeres, that they that were auncient Maſters of Ships haue derided and mocked them that haue occupied their Cards and Plattes, and alſo the obſeruation of the Altitude of the Pole, ſaying: that they care not for their Sheepes skinnes, for he could keepe a better account vpon a boord.

And when that they did take the Latitude, they would call them Starre-ſhooters, and Sunne-ſhooters, and would aske if they had ſtricken it. Wherefore now iudge of their ſkills, conſidering that theſe two points are the principall matters in Nauigation. And yet theſe ſimple people will make no ſmall bragges of themſelues, ſaying: that he hath been Maſter this twentie yeeres, and neuer had no miſfor-

tune; and also if that they could heare of any that did vse Plats and instruments, that had any misfortune, then they would not a litle brag of themselues, what notable fellows they themselues were.

O what a notable follie was in these men, not considering what they themselues were? For this is most certaine, that it is not wisedome nor cuning that can preuent or alter Gods prouidence; if that it please him to lay his scrouge vpon vs. For if that men through cunning could prouide that no misfortune should happen vnto them, then were they Gods and not men; and yet notwithstanding we must not condemne cunning and knowledge; but put all things vnto fortune, then you may take one from the plough, and make him master of a ship, and say, he hath good fortune. And thus (gentle Reader) I ceasse, requesting thee to accept this as a simple present, proceeding of good will.

Thine W. B.

FOR

To the Reader.

FOR that the common people doe fall into such a number of errours as touching the length of the day, holding an opinion, that in euery 15. daies, the day is an houre longer or shorter, the truth is this: the day doth keepe no such proportion in the lengthning and shortning, but doth lengthen and shorten according vnto the swiftnesse and slownesse of the Sunnes declination: for when the Sunne hath swift declination, then doth the day lengthen and shorten apace; and when that the declination is slow, then doth the day lengthen or shorten but slowlie. And yet the most part of the common people doe hold an opinion that at Christmasse or else at New yeres day at the furthest, the day must needs be an houre longer, and yet the Sunne hath not declined or come towards the Equinoctiall two degrees and a halfe, which will not make halfe an houre in the length of the day: wherefore I doe thinke it good to declare through the whole yeere, when the day is an houre longer or shorter here in this place, for the latitude or height of the Pole artick at London, the Pole being raised fiftie one degrees, thirtie two minutes, or thirtie foure minutes: and our longest Summer day is sixténe houres and a halfe, and our shortest winter day is seuen houres and a halfe, from the rising of the Sunne vnto the setting of the Sunne: and first this: the shortest Winter day, is the 11. or 12. day of December, and the Sunne riseth a quarter of an houre after eight, and setteth a quarter of an houre before foure of the clocke, and the Sunne hath his greatest declination vnto the Southwards. The 29. day of December, the day is a quarter of an houre longer, and the Sunne riseth at eight of the clocke, and setteth at foure. The 17. or 18. of Januarie, the day is an houre longer, and not before, for the Sunne must be declined from his *Solstice* of winter fiue degrees and twelue minutes, before the day is lengthened an houre; so that I doe affirme, that from the fourth or fift day of Nouember, vnto the 17. or 18 day of Januarie, in that time

the day is but one houre shorter or longer, which is the time of ten weekes. The 27. or 28. of Januarie the night is fifteene houres long, then riseth the Sunne halfe an houre after seauen, and setteth halfe an houre after foure of the clock. The seuenth or twelfth day of Februarie the day is ten houres long, then riseth the Sunne at seuen, and setteth at fiue of the clock. The fire and twentie day of Februarie the day is a leauen houres long, then riseth the Sunne halfe an houre after fire, and setteth halfe an houre after fiue of the clock. The eleauenth day of March, then the Sunne is in the Equinoctiall, and the day iust 12. houres long all the world ouer. The 24. day of March the day is 13. houres long, and then riseth the Sunne halfe an houre before fire, and setteth halfe an houre after fire of the clock. The seuenth day of Aprill the day is fourteene houres long, and then riseth the Sunne at fiue of the clock iust, and setteth at seauen of the clocke iust. The 23. day of Aprill the day is fifteene houres long, and then riseth the Sun halfe an houre before fiue, and setteth halfe an houre after seauen of the clocke. The 15. day of May the day is 16. houres long, the riseth the Sunne at foure of the clocke, and setteth at eight of the clocke iust. The eleuenth of June the Sunne hath his greatest declination to the Northward, and then is our longest summer day consisting of sixteene houres and a halfe from the Sun rising vnto the Sunne setting, so that the sunne riseth a quarter of an houre before foure, and setteth a quarter of an houre after eight of the clocke. The tenth day of July, the day is sixténe houres long, then riseth the sunne at foure and setteth at eight of the clocke. The last day of July, the day is fifteene houres long The 16 day of August the day is fourteene houres long. The last day of August the day is 13. houres long. The thirteene or fourteene of September the sunne is in the Equinoctiall, and the day is iust twelue houres long. The 27. day of September the day is 11. hours long. The 11. day of October the day is ten houres long. The 26 day of October the day is nine houres long. The 15.

day

day of November the day is eight houres long: and so vnto the 11. or 12. day of December, at which time the day is at the shortest, as before is declared.

Thus much haue I said, as touching the length of the day by euen houres, which some people will haue at the entrance of the Sunne into the 12. signes, but it is not so; yet this you may obserue, that when the Sunne hath declined fiue Degrées and twelue Minutes in this our Latitude, then is the day one houre longer or shorter. You shall finde this matter more largelā spoken of, concerning the length of the day in all places through the world, in the 11. Chapter of the Booke.

A Table of the reigne of Kings *since the Conqueſt.*

Number of Kings and Queenes.	The Names of the Kings of England.	Beginning of their Reigne.	Time of their death.	The place of their burial.
1	William Conqueror	14 Oct.	9 Sept. 1087	Caine in Nor
2	William Rufus	9 Sept.	1 Aug. 1100	Weſtminſt.
3	Henrie the firſt	1 Aug.	2 Dece. 1136	Reding
4	Stephen	2 Dece.	25 Oct. 1154	Feuerſham.
5	Henrie the ſecond	25 Oct.	6 July 1189	Fonteuerard.
6	Richard the firſt	6 July	9 April 1199	Fonteuerard.
7	John	6 April	19 Oct. 1216	Worceſter.
8	Henrie the third	19 Oct.	16 Nou. 1272	Weſtminſt.
9	Edward the firſt	16 Nou.	6 July 1307	Weſtminſt.
10	Edward the ſecond	6 July	25 Jan. 1327	Gloſter.
11	Edward the third	25 Jan.	21 Jun. 1377	Weſtminſt.
12	Richard the ſecond	21 June	16 Sep. 1400	Weſtminſt.
1	Henrie the fourth	16 Sep.	20 Mar. 1413	Canterburie.
14	Henrie the fift	20 May	31 Aug. 1422	Weſtminſt.
15	Henrie the firt	31 Aug.	4 Mar. 1461	Winſore.
16	Edward the fourth	4 Marc.	9 April 1483	Winſore.
17	Edward the fifth	9 April	22 Jun. 1484	Weſtminſt.
18	Richard the third	22 June	22 Aug. 1486	Leyceſter.
19	Henrie the ſeuenth	22 Aug.	22 Apr. 1509	Weſtminſt.
20	Henrie the eight	22 April	28 Jan. 1547	Winſore.
21	Edward the firt	28 Jan.	6 July 1553	Weſtminſt.
22	Quene Marie	6 July.	17 Nou 1558	Weſtminſt.
23	Quene Elizabeth	17 Nou.	24 Mar. 1602	Weſtminſt.
24	James.	24 Mar.	27 Mar. 1625	Weſtminſt.
25	Charles.	27 Mar.	whome God preſerue	

The Kalender.

			January hath xxxj. dayes.
3	1	a	New yeeres day
	2	b	Octa. Stepha.
11	3	c	Octa. Johñ
	4	d	Octa. Inno.
19	5	e	Theſolopho bi.
8	6	f	Twelfe day.
	7	g	Julian martyr
16	8	a	Seuerine biſhop
5	9	b	Martian virgin
	10	c	Paule firſt her.
13	11	d	Sunne in Aquar.
2	12	e	Satire martyr
	13	f	Oct. Epipha.
10	14	g	Iſidore martyr
	15	a	Maurice
18	16	b	Anthony Abbot
7	17	c	Marcelle biſhop
	18	d	Priſce biſhop
15	19	e	Mari and his fel.
4	20	f	Fabian and Sa.
	21	g	Agnes virgin
12	22	a	Vincent martyr
1	23	b	Emerice
	24	c	Timothy diſcip.
9	25	d	Con. of Paule
	26	e	Policarp martyr
17	27	f	Chriſoſt. Doct.
6	28	g	Theodore
14	29	a	Valerie biſhop
3	30	b	Tran. S. Marke
	31	c	Ciri. and Jan.

			February hath xxviij. dayes and in the yeere of Biſſextilis xxix. dayes.
	1	d	Brigit. Faſt
11	2	e	Puri of Mary.
19	3	f	Blaſe mar.
8	4	g	Eilbert confeſſ.
	5	a	Agathe virgin
16	6	b	Dorothy virgin
5	7	c	Amandus biſhop
	8	d	Salomon
13	9	e	Sunne in piſces.
2	10	f	Sother biſhop
	11	g	
10	12	a	Euphraſe virgin.
	13	b	Valentine biſhop
18	14	c	Fauſtine biſhop
7	15	d	Julian virgin
	16	e	Conſtance virgin
15	17	f	Simeon martyr
4	18	g	Gabine Prieſt
	19	a	
12	20	b	60. Martyrs
1	21	c	70. Martyrs
	22	d	Peters Chayre
9	23	e	Sirener. Faſt
	24	f	Mathias Apoſtle
17	25	g	Policar biſhop
6	26	a	Victor and his fel.
	27	b	Auguſtine biſhop
14	28	c	Oſwale biſhop.
3			

The Kalender.

March hath xxxj. dayes.				April hath xxx. dayes.			
3	1	d	Dauid bishop		1	g	Theodore virgin
	2	e	Basilic martyr.	11	2	a	Pary Egyptian
11	3	f	Parime martyr	19	3	b	Richard bishop
	4	g	Lucins martyr	8	4	c	Ambrose bishop
19	5	a	Focius martyr		5	d	Perci and Pa.
8	6	b	Vict. and venin.	16	6	e	Sextus martyr
	7	c	Tho. de Aquin.	5	7	f	Euphemi virgin
16	8	d	Apoline martyr		8	g	Denise mar.
5	9	e	40 Martyrs	13	9	a	Perpetuus bishop
	10	f	Gregorie bishop	2	10	b	Marcus martyr
13	11	g	Sunne in Aries		11	c	Sunne in Taurus
2	12	a	Zachary bishop	10	12	d	Apoline martyr
	13	b	Longine mar.		13	e	Sother mar.
10	14	c	Patricius bishop	18	14	f	Tiburt martyr
	15	d	Gertrude virgin	7	15	g	Osmond bishop
18	16	e	Anselme		16	a	Isidore bishop
7	17	f	Edward king	15	17	b	Anicete bishop
	18	g	Joseph spons.	4	18	c	Eluther bishop
15	19	a	Cutberd bishop		19	d	Tiburtius conf.
4	20	b	Benedict Abbot	12	20	e	Hermogenes
	21	c	Affrodose bishop	1	21	f	Quintine.
12	22	d	Pigment bishop		22	g	Clete bishop
1	23	e	Theodore	9	23	a	George martyr
	24	f	Fast		24	b	Wilfride conf.
9	25	g	Annun. of mary	17	25	c	Marke Euangelist.
	26	a	Castore martyr	6	26	d	Anastace bishop
17	27	b	John Heremy		27	e	Vitalis martyr
6	28	c	Dorothy martyr	14	28	f	Peter of Pi.
14	29	d	Eustace.	3	29	g	Clete bishop
3	30	e	Sabine virgin		30	a	Dep. of Erken.
	31	f	Balbine virgin.				

The Kalender.

May hath xxxi. Iune hath xxx dayes.

11	1	b	Philip and Iacob	19	1	e	Nicodeme
	2	c	Athanasius bish.	8	2	f	Erasmus
19	3	d	Inu. of the crosse		3	g	Basill
8	4	e	Christopher	16	4	a	Marcel martyr
	5	f	S. Augustine	5	5	b	Petrocius conf.
16	6	g	John Portlat.		6	c	Boniface bishop
5	7	a	John of Beuer	13	7	d	Medard and gil.
	8	b	Appe. of Mich.	2	8	e	Transl. Edmond
13	9	c	Transl. of Ni.		9	f	Puan conf.
	10	d	Gordaine	10	10	g	Transl. of Mol.
	11	e	Sunne in Gemini		11	a	Barnabe Apostle
10	12	f	Victorius Martyr	18	12	b	Sunne in Cancer
	13	g	Seruetius conf.	7	13	c	Anthony conf.
18	14	a	Boniface martyr		14	d	Basilides conf.
7	15	b	Sophia Virgin	15	15	e	Vate modeste
	16	c	Brandon bishop	4	16	f	Transl. Richard
15	17	d	Transl. of Bar.		17	g	Botulph conf.
4	18	e	Diosco; mart.	12	18	a	Eruperie Bishop
	19	f		1	19	b	Gerualius martyr
12	20	g	Dunstance conf.		20	c	Transl. Edward
1	21	a	Barnardine	9	21	d	Walburge virgine
	22	b	Helene Queene		22	e	Albane martyr
9	23	c	Petronil.	17	23	f	Fast
	24	d	Julian virgin	6	24	g	Iohn Baptist
17	25	e	Mesdere martyr		25	a	Transl. of Elig.
6	26	f	Adelme conf.	14	26	b	John and Pa.
	27	g		3	27	c	Trescens martyr
14	28	a	Germaine bishop		28	d	Fast
3	29	b	Nicodeme	11	29	e	Peter and Paule
	30	c	Corne martyr		30	f	
11	31	d	Felix bishop				

The Kalender.

July hath xxxi.				August hath xxxi dayes.			
19	1	g	Octa John Bap.	8	1	c	Lammas
8	2	a	Visit. of Mary	16	2	d	Stephen bishop
	3	b	Gregory bishop		3	e	Finding of Ste.
16	4	c	Domitius martyr		4	f	Justine priest
5	5	d	Parthene Conf.	5	5	g	Festum nivis
	6	e	Procope martyr		6	a	Transf. Domini.
13	7	f	Zenone martyr	13	7	b	Feast of Jesu
2	8	g	Paterian bishop	2	8	c	Ciracke & his fel.
	9	a	Pius bishop		9	d	Roman martyr
10	10	b	Dog daies begin.	10	10	e	Laurence martyr
	11	c	Herinaco. for.		11	f	Tiburt and Su.
18	12	d	Anaclete bishop	18	12	g	Clare virgin
7	13	e	Muirine and Ju.	7	13	a	Ypolite virgin
	14	f	Sunne in Leo		14	b	Sunne in Virgo
15	15	g	Marine virgin	15	15	c	Assump. of Mary
4	16	a	Simph. cum 7.	4	16	d	Roche Conf.
	17	b	Arlene hem.		17	e	Octa Laurence
12	18	c	Praede virgin	12	18	f	Agapite martyr
1	19	d	Margar. virgin	1	19	g	Lewis bishop
	20	e	Praede virgin		20	a	Dog daies end
9	21	f	Apoline bishop	9	21	b	Anastase martyr
	22	g	Mary Magdalene		22	c	Timo. and Hip.
17	23	a	Christian	17	23	d	Eleazor Fast
6	24	b	Fast	6	24	e	Bartho. Apost.
	25	c	James Apostle		25	f	Lewis King
14	26	d	Anne mo. of Mary	14	26	g	Zepherine bishop
3	27	e	Panthaleon.	3	27	a	Rufus martyr
	28	f	Sampson bishop		28	b	Augustine bishop
11	29	g	Mary virgin	11	29	c	John beheaded
	30	a	Abbo. and sen.		30	d	Felix and Auda.
19	31	b	German bishop		31	e	Cuthber virgin.

September hath xxx dayes. October hath xxxi. dayes.

8	1	F	Giles Abbot	16	1	a	Remegius bishop
16	2	g	Anthony Martyr	5	2	b	Leodegar martyr
5	3	a	Eupheme	13	3	c	Candide martyr
	4	b	Moses Pro.	2	4	d	Frances martyr
13	5	c	Aenturine		5	e	Faith Virgin
2	6	d	Zacharie Prop.	10	6	F	Gerionis
	7	e	Enurce Bishop.		7	g	Marce and mar.
10	8	F	Nativitie of Ma.	18	8	a	Apolinaris mar.
	9	g	Gorgone martyr	7	9	b	Pelagi Virgin.
18	10	a	Nicholas de Lo.		10	c	Linus confes.
7	11	b	Protece and Hi.	15	11	d	Dinice & his fel.
	12	c	Sire Bishop	4	12	e	Michaius Bishop
15	13	d	Philip bishop		13	f	Wilfride bishop
4	14	e	unn in Libra.	12	14	g	Sunne in Scorpio
	15	F	Nicodeme priest	1	15	a	Calixt bishop
12	16	g	Edith Virgin		16	b	Wolfran bishop
1	17	a	Lambart Bishop	9	17	c	Pich, of the mount
	18	b	Victor and Cor.		18	d	Luke Evangelist.
9	19	c	Eustace	17	19	e	Etheldred virgin.
	20	d	Fast.	6	20	f	Frideswide virgine
17	21	e	Mathew Apostle.		21		Audtrebet virgin
6	22	F	Maurice	14	22	g	ri M virgins
	23	g	Line Martyr	3	23	b	Mary Salome
14	24	a	Germon Abbot		24	c	Romane Bishop
	25	b	Cleophin and Ap.	11	25	d	Magloze bishop
3	26	c	Cyprian and Jul.		26	e	Chrisp. and Chris.
	27	d	Cosme and Da.	19	27	f	Fast.
11	28	e	Erupere bishop	8	28	g	Simon and Iude.
19	29	f	Michael Arch.		29	a	Narcissus bishop
	30	g	Hierome Doct.	16	30	b	Germaine conf.
8				5	31		Fast.

November hath xxx dayes. December hath xxxi. dayes.

	1	d	All Saints		1	f	Elegi bishop
13	2	e	All Soules	13	2	g	Liban martyr
2	3	f	Winefride virg.	2	3	a	Dep. of Osmond
	4	g	Amantius		4	b	Barbara virgin
10	5	a	Lete Priest	10	5	c	Sabba bishop
	6	b	Leonard		6	d	Nicholas bishop
18	7	c	Wilboyde	18	7	e	Dia Andrew
7	8	d	Foure crowned	7	8	f	Con. of Mary
	9	e	Theodore		9	g	Cyprian bishop
15	10	f	Martine	15	10	a	Eulalie virgin.
4	11	g	Martine bishop	4	11	b	Antippe
	12	a	Brise bishop		12	c	Damase conf.
12	13	b	Sunne in Sagit.	12	13	d	Sun in Capricor.
1	14	c	Tran. Erkenew	1	14	e	Nicasius virgin
	15	d	Macute bishop		15	f	Othalie virgine
9	16	e	Dep. of Edmond	9	16	g	O Sapientia
	17	f	nit. Reg. Elizab.		17	a	Lazarus conf.
17	18	g	Dia Martins	17	18	b	Gratian bishop
6	19	a	Elizabeth Pr.	6	19	c	Venetian virgin.
	20	b	Edmond King		20	d	Fast.
14	21	c	Pres. of Mary	14	21	e	Thomas Apostle
3	22	d	Cicely virgine	3	22	f	iii. Martyrs
	23	e	Clement mar.		23	g	Victor virgin
11	24	f	Grisogon mar.	11	24	a	Fast.
19	25	g	Catherine virg.		25	b	Christmas day
	26	a	Line martyr	19	26	c	Stephen martyr
8	27	b	Vitalis conf.	8	27	d	Iohn Evangelist
	28	c	Rufus mar.		28	e	Innocents day.
16	29	d	Saturni. Fast	16	29	f	
5	30	e	Andrew Apostle	5	30	g	Tran. of James
				13	31	a	Silvester martyr.

Here-

Hereafter followeth a most excellent, necessary and compendious Kalender, shewing the Prime, Epact, Dominicail Letter, Leape yeares, and moveable Feasts, for 24 yeares, Inclusively comprehending therewith the true day and houre of the Moones Coniunction or Change, for 19 yeares to come, with the true place of the Sun, and his Declination from the Equinoctiall, both Northwards, and Southwards upon every degree thereof, through the twelve monethes of the Yeare.

Yeare of our Lord	Prime.	Epact.	Letter.	Sunday	First Sunday in Lent.	Faster day.	Ascen. day.	Whit-Sunday.	Trinity Sunday.
1616	2	22	G	F	Feb. 18.	Marc. 31	May. 9	May 19	May 26
1617	3	3	E		March 9	April 20	29	June 8	June 15
1618	4	14	D		Febr. 22	5	14	May 24	May 31
1629	5	25	C		14	Mar. 28	0	16	23
1620	6	6	B	A	March 5	April 16	25	June 4	June 11
1621	7	17	G		Febr. 18	1	10	May 20	May 27
1622	8	28	E		Mar. 10	21	30	June 9	June 16
1623	9	9	F		2	13	22	1	8
1624	10	20	D	C	Febr. 15	Mar. 28	6	May 16	May 23
1625	11	1	B		March 6	April 17	26	June 5	June 12
1626	12	12	A		Febr. 26	9	18	May 28	4
1627	13	23	G		11	Mar. 25	3	13	May 20
1628	14	4	F	E	2	April 13	22	June 1	June 8
1629	15	15	D		Febr. 22	5	14	May 24	May 31
1630	16	26	C		14	Mar. 28	6	16	23
1631	17	7	B		27	April 10	19	29	June 5
1632	18	18	A	G	18	1	10	20	May 27
1633	19	29	F		Mar. 10	21	30	June 9	June 16
1634	1	11	E		Febr. 23	6	15	May 25	1
1635	2	22	D		15	Mar. 29	7	17	May 24
1636	3	3	C	B	March 6	April 16	25	June 4	June 11
1637	4	14	A		Febr. 26	9	18	May 28	4
1638	5	25	G		7	March	3	13	May 20
1639	6	6	F		27	April 14	23	June 2	June 9

A profitable and necessary rule to know the beginning and ending of every Tearme, with their returnes.

Hillarie Tearme **beginneth the xviii. of January, if it be not Sunday, which then is referred vntill the next day after. and endeth the xii. of Februarie, and hath foure Returns, that is to say:**

Octavis Hillarij	Crastino Purific.
Quind. Hillarij.	Octavis Purific.

Easter Tearme **beginneth xvii. dayes after Easter, and endeth the Munday next after the Ascention day, and hath fiue Returnes, that is to say:**

Quind. Pasch.	Mens.	Quinque Paschæ.
Tres Paschæ.	Paschæ.	Crast. Ascention.

Trinity Terme **beginneth the Friday next after Trinitie Sunday, and endeth the Wednesday fortnight after, and hath foure Returnes, that is to say:**

Crast. Trinitatis.	Quind. Trinitatis.
Octavis Trinita.	Tres Trinitatis.

Michalmas Terme **beginneth the ix. day of October, if it be not Sunday. and endeth the xxviii, or xix. of November, and hath eight returnes, that is to say:**

Octavis Michael.	Crast. Animarum.
Quind. Michael	Crast. Martini.
Tres Michaelis.	Octa. Martini.
Mense Michael.	Quind. Martini.

Note also, that the Exchequer openeth eigh dayes before any Tearme beginne, except Trinity tearme, **which openeth but foure dayes before.**

{Thirty daies hath September, Aprill, Iune, and November
{February hath xxviij alone: and all the rest thirty and one.

An Introduction vnto the *Regiment for the* SEA.

¶ The names of certaine things, neceſſary to be knowne of them that are Mariners or Seafaring men, meete to bee known of them that doe practiſe Navigation, as theſe: the names of the circles of the Sphere: and what they are, and their uſes: and alſo the names of other things belonging thereunto, and what they are, and their uſes.

First, what the Horizon is.

THE Horizon is a great circle of the Globe, diuiding the part of the world ſeene, from the part vnſeene; and this Horizon is changed when you doe moue: for as you doe by trauaile change your place, ſo doeth the Horizon alter continually.

The vſe of the Horizon circle.

The vſe of the Horizon is this; the height of the Sunne or any Starre is counted from it vpward, the which height is taken with the croſſe ſtaffe, ſetting the one end with the Horizon, and the other ende with the Sunne or Starre, ſo that you haue a true Horizon: The which true Horizon is to bee found onely at the Sea, or elſe vpon a very plaine ground vpon the top of a hill. Moreouer if the Sunne or Moone, or any Starre be to be ſeene, then they be aboue the Horizon: if they be not to be ſeene, then they be vnder the Horizon.

2. What the Meridian is.

The Meridian is a great circle paſſing through the poles of the world, and your Zenith or vertical point, and if you doe trauaile due South and North, you doe not

change your Meridian: but in the going or trauailing any other way you do change it.

The vse of the Meridian circle.

The vse of the Meridian circle is, to know the iuſt time of noone by the Sunne: for as ſoone as the middle of the Sunne is in the Meridian, then it is noone; and when the Sunne, Moone, or any Starre is in the Meridian, then they be far beſt from the Horizon, and it is a meete time to take their height, for to know the Altitude or height of the Pole of the world, whereby you may perfectly know, how farre you be to the Southwarde, or Northwards of any place.

3 What the Equinoctiall circle is.

The Equinoctiall is a great circle in the heauens, equally diſtant from both the Poles, and doth paſſe directly ouer the middle of the earth round about; and is called the Equinoctiall, for that if the Sunne be there, then throw all the whole world the Sunne is 12 houres abone the Horizon, and 12 houres vnder the Horizon ſauing vnder the two Poles, where the Equinoctiall is coincident with the Horizon. So they ſhall ſe halfe the ſunne and no more, till the ſunne be departed from the Equinoctiall; and alſo to them that doe inhabite or dwell in any place vnder the Equinoctiall, the Sunne, Moone, and all the Starres, be twelue houres aboue the Horizon, and twelue houres vnder the Horizon.

The vſe of the Equinoctiall circle.

The vſe of the Equinoctiall, is to know what declination the ſunne or any other ſtarre hath from it, and on which ſide, by the which declination the height of the Equinoctiall is knowne, and by the height of the Equinoctiall is knowne the height of either of the two Poles of the world.

4 What the circle or Tropicke of Cancer is, being a parallel circle.

The

The Tropicke of Cancer, is a leſſe circle of the Spheare, limiting the greateſt declination that the Sunne doth come vnto Northwards, and then is our longeſt ſummer day, and ſhorteſt night.

5. What the circle or Tropicke of Capricorne is, being a parallel circle.

The Tropicke of Capricorne, is a leſſer circle, limiting the greateſt declination that the Sunne hath Southwards, and then is our ſhorteſt winter day, and longeſt night.

The vſes of theſe two circles be but ſmall, but that the ſunne comming vnto them, the daies be at the longeſt or ſhorteſt, and the ſunne doth then returne backe againe &c.

6. What the Articke circle is.

The Articke or Polar circle is a leſſer circle of the Spheare paſſing through the North Pole of the Ecliptique, parallel to the Equinoctiall, and is diſtant from the Pole of the world ſo much as the Tropickes are remote from the Equinoctiall; which in our time is 23 degrees, 31 minutes and 30 ſeconds.

For ſo much as is the obliquity of the Zodiack (whereto the diſtance of the Tropickes from the Equinoctiall is equall) ſo much are the Poles of the Ecliptique diſtant from the Poles of the world.

The vſe of the Articke.

The vſe of the Articke circle, is to ſhew the Pole of the Zodiack, and its diſtance from the Pole of the Equinoctiall, and to ſeparate a temperate Zone from the cold Zone: Here note that if the North Pole be raiſed more then 66 degrees and a halfe, the Sunne or Moone being in the Tropicke of Cancer, ſhall not goe downe vnder the Horizon, but ſhall be ſtill in ſight vnto vs, ſo that they be not let by the cloudes and other accidents.

7. What the Antarcticke circle is.

What was before spoken of the Arcticke circle, may be applyed vnto the Antarcticke circle, with relation onely to the Southerne Hemisphere. for it is opposite or right against the Arcticke circle, not differing from it, saving that the Arcticke circle is above the Horizon, and the Antarcticke circle is vnderneath the Horizon in this Northerne Hemisphere of 23 gr. 31 m. ; latitude.

The vse of the Antarcticke circle.

The vse of the Antarcticke circle, is the same with the Arcticke circle.

8. VVhat the Zodiacke is being a great circle.

The Zodiacke is a great circle in the heauens, vnder the which all the wandring lights or Planets doe keepe their courses, that is to say, the Sonne and Mone, and the other fiue Planets or Starres; Saturne, Iupiter, Mars, Venus, and Mercurie. This circle is diuided into twelue equall parts called the xii. Signes: which are these; Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius. Pisces the said circle standeth oblique or awrie, crossing the Equinoctiall in the middle at two places: and is 12 degrees broad, that is to say, fiue degrees from the middest Northward, and fiue degrees vnto the Southward.

The vse of the Zodiacke.

The vse of the Zodiacke is, to knowe in what signe the Sunne and Mone, and the other Planets are, and also to knowe all the aspects; and in like manner to knowe the aspects

pects of all the other Planets vnto the Moone, also the Planets amongst themselues: & by the aspects in the xii. signes is gathered their effects, and in what Countrie they may happen.

9. What the line Eclipticke is.

The line Eclipticke is a circle in the very middle of the Zodiacke, vnder the which the very middle or center of the Sunne doth continually moue.

The vse of the line Eclipticke.

The vse of the line Eclipticke is this, if that the Moone or any other Starre, be vnto the North part thereof, then it is said, that they haue North Latitude, and if vnto the South part, then they haue South Latitude: and also by this circle called the line Eclipticke, is knowne the Eclipse of the Sunne and the Moone.

10 What the two circles called Colures be, &c.

The two circles called Colures, be those that doe diuide the Zodiacke, and all the other parallel circles, into foure equall parts, the one of the circles doth crosse the Zodiacke in the first point of Aries and Libra, and so passeth by the poles of the world, and is called the Equinoctiall colure: and the other Colure circle doth crosse the Zodiacke in the first point of Cancer and Capricorne, and so passeth the two Poles of the world, and at the two Poles the one circle doth crosse the other: and that is called the Solsticiall Colure.

The vse of these two circles.

The vse of the two Colure circles is this; the sunne pas-

sing by them, doth diuide the yere into four parts in this manner, the Sunne in the first point of Aries is Spring time, &c.

11. What the two Poles of the world are.

The two Poles of the world, (that is to say, the North Pole called the Pole Artick, & the South Pole called the Pole Antartick, are two points in the heauens, whereof the one is directly against the other, at the ends of the Axletree of the world: the North Pole is alwayes aboue our Horizon, and the South Pole Antartick alwayes vnder our Horizon, and the Equinoctiall iust and equally betweene them: from these two Poles there must be vnderstood a right line to be drawne, which is called the Axletree of the world, about the which the whole heauens, and all the lights of the Firmament be carried round from the East vnto the West in xxiiii houres: so that no light nor place in the heauens remaineth vnremoued, but onely the two Poles of the world, and the said Axletree.

The vse of the Poles of the world.

The vse of the two Poles is this, to know how farre wee doe transport our selues, and to know what Climate and temperateneſſe we be in, as touching heat and cold.

12 What the two Poles of the Zodiacke are.

The two Poles of the Zodiacke, or Eclipticke, imagined to be at the end of the Axletree of the Zodiacke or Eclipticke, are the Artick pole of the Zodiacke, or rather the Eclipticke, and the Antartickepole of the Zodiacke, the one being directly against the other, and the Zodiacke or the Ecliptick, to be iust or equall betwane them.

13 What

13. What the Zenith or verticall point is.

The Zenith or verticall point, is imagined to be a pricke in the heauens right ouer the crowne of your head, and is moueable as we our selues be, and is the Pole of the Horizon circle: and as you doe transport your selfe from one place vnto another, so doth your Zenith or verticall point, and your Horizon circle also change.

The vse of the Zenith or verticall point, &c.

The vse of the Zenith or verticall point is this, to know how neere or how farre off any starr is from your Zenith, by taking the true height of any starre with an instrument, for that from your Zenith is alwayes 90. degrees downe vnto the Horizon on euery side round about you, as it shall more painely appeare hereafter, where I speake of degrees.

14. What a degree is,

A degree, is one part or diuision of a whole circle diuided into 360. equall parts, how big or small soeuer the circle be.

The vse of the degree is manifold.

The vse of the degrees, is to measure the Sunne and Mones course in the Zodiacke, or any other of the Planets or moueable Starres, how farr they be asunder: whereby it is knowne at what time they haue any aspect the the one with the other. And also by the degrees is measured the latitude and the declination any light or starre hath from the Ecliptick or Equinoctiall: & also the degrees will shew vnto you how many miles that you doe transport your selfe vpon the earth to the South or North parts, for that euery

degrée doth answer vnto 60 English miles, in the going South and North: which is knowne by the altitude of the North Pole, or the number of degrees betweene the Equinoctiall and your Zenith or verticall point, for from your Zenith unto the Horizon is 90 degrees to the Southwardes and 90 degrées vnto the Northwardes, which is halfe the compasse of the heauens, for twise 90 is 180 and then the earth doth hide the other halfe of the heauens: and twise 180 maketh 360 the whole content of the compasse of euery great Circle in the heauens.

15 What a minute is.

Of minutes there be two sorts, minutes of time, and minutes of measure, and is no other thing but the 60 part of a degrée, or the 60 part of an houre: and all the diuisions in these matters are by 60. For as 60 minutes is a degree, or an houre, so 60 seconds is a minute, and 60 thirds is a second, and 60 fourths is a third, &c.

16 Altitude or height, and the vse thereof.

Altitude or the height of any thing taken (as the height of the Sunne or any Starre, or the height of the Pole aboue the Horizon is an arch of a verticall circle contained betweene the center of the Sunne or Starre, or betweene the top of any thing whose height we desire to know, and the Horizon, limited and expressed by the degrées or parts of that instrument whereby we take the said height.

17 Latitude is Wideneſſe, the vſe thereof.

Latitude is in the heauens: if the Sunne or any other Starre be vnto the South parts, or the North parts of the Ecliptike, that then it is said to be so many degrées in Latitude or wideneſſe from the line Ecliptick to the South or North part: and also Latitude is counted vpon the

the earth in like manner, if that you be in any place betweene the Equinoctiall and any of the two Poles, and it is expreſſed by the degrees of the Meridian contained betweene the Equinoctiall and the Zenith, or verticall point of the place wherein you are, either to the South or Northpart, &c.

18 Longitude is length: the vſe thereof.

Longitude in the heauens is, the portion of the Ecliptick, contained betweene the head of Aries and that great circle which is drawne from the Poles of the Ecliptick through the center of the ſunne or any other Starre whatſoeuer, downe vnto the Ecliptick, the which Longitude is expreſſed either by the number of degrees contained in the ſaid portiõ of the Ecliptick, or elſe by the ſigne and the particular degrees of that ſigne, vpon which the foreſaid great circle drawne from the Poles of the Ecliptick doth light. As for example, if the portion of the Ecliptick contained betweene the head of Aries, and that great circle which is drawn from the Poles of the ecliptick through the center of any Starre, vnto the Ecliptick, doe comprehend 100. 200 or 300, &c. degrees, then is the Longitude of that Starre ſaid to bee ſo much or otherwiſe if the ſaid great circle light vpon any Signe as vpon Taurus or Gemini, then is the Starre ſaid to haue his Longitude in Taurus, &c. And alſo Longitude vpon the earth, is counted from the Canarie Ilands vnto the Eaſtward, and it is that portion of the Equinoctiall which is contained betweene the Meridian of the Canarie Ilands and the Meridian of the place aſſigned. This Longitude is denominated and expreſſed by the degrees of the Equinoctiall contained betweene the two foreſaid Meridians, ſo that if betweene the ſaid Meridians there be contained 20. 30. 40 &c. degrees, then is the aſſigned place ſaid to be ſo much in Longitude whereby is knowne the time of the changes of the Moone, or any other aſpect, or any Eclipſe of the Sunne or Moone at the City or towne.

19 De-

19. Declination is leaning: the vse thereof.

Declination is counted in the heauens, if that the Sunne or any other starre be vnto the North part or South part of the Equinoctiall; and it is designed or expressed by the degrees of the great circle drawne from the Poles of the world through the center of the Sunne or starre, contained betweene the Equinoctiall and the center of the Sunne or starre propounded, whereby it is said, that the Sunne or starre hath so many degrees of declination to the South, or to the North parts as it happeneth, &c.

20. A Circumference is the line which incloseth a circle by the outer edge.

21. Diameter is the breath of a circle, passing right ouer the center or middle thereof, from outside vnto outside.

22. Center is the midle pricke in any circle, equally distant from the edge of the circle in euery place.

23. Parallel lines or circles are, two lines or more, (how many soeuer there be) equally distant in euery place alike.

24. Auge, what it is.

Auge is a point of the Circumference of the Eccentrique, most remote from the center of the world, and highest to the firmament: and the opposition thereof is, when that the Sunne and Moone doe come nearer vnto the earth, then they doe at any other time.

The vse thereof.

The vse thereof is, to know when the Planetts bee in their swift motion, or in their slow motion: for the Sunne and Moone being in the Auge, moueth slower then in the opposite of the Auge,

25. Eccen-

25. Eccentricitie, what it is.

Eccentricitie, is the diſtance betwæne the center of the eccentricke circle of any Planet, and the center of the woꝛld.

26 What the head or the taile of the Dragon is.

The head of the Dꝛagon, is the place where that the Mone oꝛ any other Planet doth come ouer the line Eclipticke from the South part vnto the Noꝛth part: and the taile of the Dꝛagon is, where the Mone oꝛ any other Planet palleth ouer the line Eclipticke, from the Noꝛth part, vnto the South part.

The vſe of the head and taile of the Dragon.

The vſe of the head and the taile of the Dꝛagon, is to know, when that there is any Eclipſe of the Sunne oꝛ Moone; and of what quantity oꝛ greatnes the Eclipſe is.

27 Paralax, what it is.

Paralax is the poꝛtion of the heauen contained betwæne two right lines, whereof the one is dꝛawne from the center of the woꝛld, the other from the ſurface of the earth, through the center of the Mone oꝛ ſome other Planet, vnto the Sphæare of the fixed ſtarres.

The vſe thereof.

The vſe of the Paralax is manifold, ſoꝛ that it ſheweth where and in what countries that the Sunne is eclipſed, as in ſome places the ſunne may bee all wholly Eclipſed, and in ſome place halfe Eclipſed, and in ſome parts of the earth nothing eclipſed at all, and yet the Sunne and the Mone both aboue the Hoꝛizon, which reaſon is beꝛe ſhewed. And alſo the vſe of the Paralax is, if that you doe

ſee

ſee any extraordinary light in the heauens, as Comets or blazing ſtarres, by their Paralax their diſtance is knowne what they are from the earth, and by their diſtance their Diameter being taken, then the magnitude of the body is knowne, therefore there are great things to be knowne by the obſeruation of the Paralax.

28 What Nauigation is.

Nauigation is an Art teaching how to direct our courſe in the Sea, to any place aſſigned, & by what direction, what things may ſtand with him, and what things may ſtand againſt him, hauing conſideration how to preſerue the Ship in all ſtormes and changes of weather that may happen by the way, to bring the Ship ſafe vnto the port aſſigned, and in the ſhorteſt time.

The vſe of Nauigation.

The vſe thereof is this, firſt to know how that the place doth beare from him, by what winde or point of the compaſſe, and alſo how farre that the place is from him, and alſo to conſider the ſtreame, or tide-gates and Currents, which way that they doe ſet or driue the Ship, and alſo to conſider what dangers are by the way, as Rocks and Sands, & ſuch other like impediments, and alſo if that the winde change or ſhift by the way, to conſider which way to ſtand, and direct his courſe vnto the moſt aduantage, to attaine vnto the port in ſhorteſt time: and alſo if any ſtormes doe happen by the way, to conſider how for to preſerue the Ship and the goods, and to bring her ſafe vnto the port aſſigned. And alſo it is moſt principally to be conſidered and foreſeene, that if they haue hap by occaſion of a contrary tempeſt, for to goe very much out of the courſe or way, to know how the place doth then beare, that is to ſay, by what point of the compaſſe the place doth ſtand from you: and alſo how farre it may bee from you. Which way to be knowne, is this: Firſt, to conſider

ſiuer by what point that the Ship hath made her way by, & how faſt or ſlowly that the Ship hath gone, and to conſider how often that the Ship hath altered her courſe, and how much that ſhe hath gone at euery time, and then to conſider all this in your Plat or Card, and ſo you may giue a neare geſſe, by what point or winde it beareth from you, and alſo how farre it is thither. And alſo you may haue a great helpe by the Sunne or Starres, to take the height of the Pole aboue the Horizon, and alſo in ſome place you may geſſe by the ſounding, both by the depth and alſo by the ground. And alſo it is very meete and neceſſary to know any place when that he doth ſee it.

29. Of Inſtruments to vſe at the Sea, for to take the height of the Sunne, or any Starres.

The originall of the making of all Inſtruments to take the height of the Sunne or any Starre, is either a circle, or the part of a circle whoſe diuiſion is into 360. parts, what forme ſoeuer that it hath, as your croſſe ſtaffe it is marked according vnto the proportion of a circle: and euery one of the degrees is the equall part of a circle: namely, the three hundred and ſixtie part, &c.

The vſe of the Inſtruments.

The vſe of the Inſtruments, as Aſtrolabes, or common rings, or the croſſe ſtaffe, is to take the height of the Sunne or other Starres, whoſe vſes doe follow hereafter in the booke.

30. VVhat manner of perſons be meeteſt to take charge of Ships in Nauigation.

As touching theſe perſons that are méete to take charge, that is to ſay, to be as a Maſter of ſhips in Nauigation, he ought

ought to be sober and wise, and not to be light or rash headed, nor to be too fumish or hasty, but such a one as can well gouerne himselfe, or else it is not possible for him to gouerne his company well: he ought not to be to simple, but he must be such a one as must keepe his company in awe of him, (by discretion) doing his company no iniury or wrong: but to let them haue that which men ought to haue, & then to see vnto them, that they doe their labour as men ought to doe, in all points. And the principall point in gouernment is, to cause himselfe both to be feared, and loued, and that groweth principally by this meanes, to cherish men in well doing, and those men that be honestly addicted, to let them haue reasonable preheminence, so that it be not hurtfull vnto the Merchant, nor to himselfe; & to punish those that be malefactors and disturbers of their company, and for small faults to giue them gentle admonition to amend them: and principally these two points are to be foreseene by the Maisters, (that is) to serue God himselfe, and to see that all the whole company do so in like manner at such conuenient time as it is meet to be done. The second point is, that the Master vse no play at the dice or cards: neither (as neere as he can) to suffer any, for the sufferance thereof may doe very much hurt, in diuers respects: and furthermore, the master ought to be such a one, as doth knowe the Mones course, whereby he doth knowe at what time it is a full sea, & a low water, knowing in what quarter or part of the skie, that the Mone doth make a full sea at that place; and also the maister ought to be acquainted, & knowe that place well, that he doth take charge to goe vnto (except that he hath a Pilot.) And also he that taketh charge vpon him, ought to be expert how the tide-gates or currents, doe set from place vnto place: and also not to bee ignorant of such daungers as lye by the way, as rocks, sands, or banckes; and also most principally, he ought to be such a one as can very well direct his courses vnto any place assigned, and to haue capacity how for to handle or shift himselfe in foule weather or stormes. And also it behoueth

neth him to be a good coaster, that is to say, to know euery place by the sight thereof. And also he that taketh charge for long voyages ought to haue knowledge in Plats or Cards, and also in such instruments, as be mete to take the height of the Sunne or any Starre, and to haue capacitie to correct those instruments, & also he ought to be such a one, that can calculate the Sunnes declination, or else to haue some true regiment, and also he ought to knowe how to handle the Sunnes declination, when that he hath taken the height of the Sunne.

Now beginneth the Regiment for the Sea, the first Chapter of Nauigation, and sheweth what the 32. points of the Compasse are, and to what vse they doe serue.

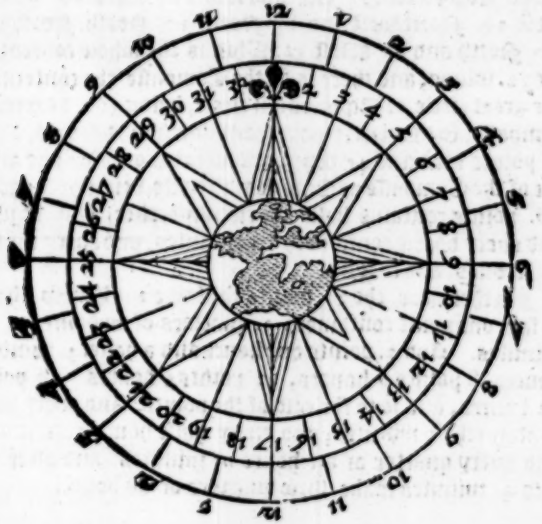
THE first and most principall thing for any seafaring man, or trauailer, is to knowe toward what part of the earth he meaneth to goe, & then being vpon the sea, where he seeth no path nor marke to trauaile by, he ought to be expert in the vse of the Needle or Compasse Wherein this is to be noted: there be eight Capitall or head winds or points, whereof foure of them are called Cardinalls, and haue their names properly of themselues; & the other foure of them, are deriued or take their names of the other foure, as thus: South & North are in the opposite points of the intersection of the Horizon and Meridian, and East is in the intersection of the Equinoctiall and the Horizon, towards the Sun-rising, and West is right against it. North-east is in the midway betweene the East and the North, & South-east in the midway betweene the East and the South, and South-west betweene the West & the South & North-west is in the middle betweene the North & the West. Moreouer, there be 8. inferior points or winds, halfe way betweene euery one of those eight Capitall or head points or windes, and those haue their names of

8 Capitall or head points.

8. Inferior points or winds.

of the two points that he ſtandeth betwæne, as that point that ſtandeth betwæne the Nozth and the Nozth-eaſt: is called Nozth Nozthеaſt, and that point betwæne the Eaſt and the Nozth-eaſt is called Eaſt Nozth-eaſt, and alſo that point that is betwæne the Eaſt and the South-eaſt, is called Eaſt South-eaſt. And ſo forth vnto the reſt of the eight points, whoſe names doe follow, as South South-eaſt, and South South-weſt, and Weſt South-weſt, & Weſt Nozth-weſt, and Nozth Nozth-weſt: and now betwæne euery one of theſe inferiour points, and euery one of the head winds, there is a bypoint oz wind: and hee is called a bypoint, foz that hee is not named but by the name of one of the head points, next adioyning. There be 16 of them in number, ſo that there be eight capitall oz head points, and eight inferioz points, and 16 bypoints oz winds, ſo that in all there be 32 of them. The vſe of theſe points is, to direct the Ship to what quarter of the woꝛld you doe aſſigne, to kæpe that courſe, to find the place ſo aſſigned, foz that the propertie of the Nædle oz Flie, is alwayes to ſtand due South and Nozth.

As



As touching Nauigation, for the instructions of the meanest, I haue set this figure or Compasse, where first is to be noted the 32 windsand points of the Compasse aboue made. The Flouredeluce is the first point; and these be the names beginning at the North, and so with the course of the Sunne, according vnto the common order that Seamen doe teach or instruct their youth, which is this: North 1. North and by east 2. North Northeast 3. Northeast and by North 4 Northeast 5. Northeast & by East 6 East Northeast 7. East and by North 8. East 9. East and by South 10. East Southeast 11. southeast and by East 12 southeast 13. Southeast and by South 14. south Southeast 15. South and by East 16. South 17. South and by West 18. South Southwest 19 Southwest and by South 20 Southwest 21. Southwest and by West 22. West Southwest 23.

The names of the 32 points of the compas.

West and by South 24. West 25. West and by North 26. West Northwest 27. Northwest and by West 28 Northwest 29. Northwest and by North 30. North Northwest 31. North and by West 32. This is the whole contents of the 32. winds, and there is in the Compasse the contents of the great circle, or Equinoctiall circle, being 360. degrees in compasse, so that euery point containeth 11. degrees, ¼. and 4. points containe 45. degrées, 8. points containe one quarter of the Compasse or Equinoctiall circle, being 90. degrées, 16. points containe halfe the circumference, 180. degrées, and euery degrée containeth 60. minutes, and euery minute 60. seconds, and so forth.

The contents of the Equinoctiall circle 360 degrees, one point of the Compasse containeth 11. degrees and a quarter,

Furthermore, the 32. points containe 24. houres, that is to say, one point containeth 3. quarters of an houre, or 45. minutes. And 2. points one houre and a halfe. 4. points 3. houres, 8 points 6 houres, 12 points 9 houres, 16 points 12 houres, and so to the rest of the points. And euery houre containeth 60 minutes; and euery halfe houre 30 minutes, and euery quarter of an houre 15 minutes, and after that rate 45 minutes make three quarters of an houre.

The 32. points brought into 24 houres,

THE

The ſecond Chapter treateth of the Golden number or Prime, ſhewing the Epact, and by the Epact, to know the age of the Moone.

IT is neceſſary and conuenient for the ſeafaring men, to know the Prime or Golden number: for by the Golden number is knowne the Epact, and the Epact ſheweth the age of the Moone or change day, within twelue houres vnder or ouer: and by the age of the Moone, you may know at what a clocke it doth flow, in any place that you doe know what moone doth make a full ſea: therefore it is meete to know the Epact, and that is knowne by the Prime, or golden number. The cauſe why it was called the golden number, was becauſe it was ſent out of Egypt in letters of gold, to the Romanes.

The cauſe why that it is called the Prime, was for that it was the firſt order that the Moones courſe was knowne by, and it is thus knowne. Adde one to the yeere of our Lord whereof you would know the golden number or Prime, then diuide the number by 19. the remainder is the Prime: and multiply that by 11. and loke what the number commeth vnto, diuide that by 30. the remainder is the Epact. Then when you haue once the Epact, adde 11. to your Epact for euery yeere more, and looke what that commeth to, that is your Epact: and if it do paſſe 30. put that away, and kepe the remainder for your Epact. And thus this rule will ſerue for euer, ſauing when the Prime beginneth at one, for then the Epact is 11. and then do (as aforeſaid) as you may perceiue by this Table here following.

The cauſe why that is called the Prime, or golden number.

To know how many the Epacts is.

The Table of Prime and Epact

for xix. years, and when those xix. years be ended then begin againe, and so it will serue for euer, &c.

The yeere of the Lord	Prime	Epact	The yeere of the Lord	Prime	Epact
1630	16	26	1640	7	17
1631	17	7	1641	8	28
1632	18	18	1642	9	9
1633	19	29	1643	10	20
1634	1	11	1644	11	1
1635	2	22	1645	12	12
1636	3	3	1646	13	23
1637	4	14	1647	14	4
1638	5	25	1648	15	15
1639	6	6			

The Prime is the time of xix yeares.

THe Prime or golden number, is the time of 19 yéres, in the which time the Moone maketh all her changes or coniunctions with the Sunne, and when these nineteene yéres be expired, then she beginneth againe: as for example. In the yére of our Lord 1619 she changed the 16 day of March, and euery yére doth alter 11 daies of her change, till the yére 1638. and then she changeth the said twentie sixth day of March againe, as I shewed you before in the putting to 11 for euery yére. Now furthermore to know the age of the Moone, doe thus; take the number of the Epact for your yére (beginning at March alwayes) and reckon how many moneths it is from March (counting March for one.) then reckon how many daies of the moneth it is, in which you would know the age of the moone: then put

put all your number together, (that is to say, your Epact, your moneth from Mardh, and euery day of the month) then looke how many it amounteth vnto, that is the age of the Moone, if the number added doth not exceed 30. but if it passe 30. throw all the 30. away, the remainder sheweth the age of the moone, for when the age of the moone is iust 30, then is it the change day. This is to be vnderstood concerning those months which haue 31. dayes, for in them that haue only 30 dayes, the coniunction is at the 29. day, & they which passe 29. are the age of the moone: Item vnto February, we must giue 29 dayes, though ordinarily that moneth hath but 29. dayes, & if it be the fifteenth day of the age of the moone, then the moone is at the full. When the age is betweene seuen dayes & eight, then is the first quarter. And if it be 22 dayes old, then the moone is at the last quarter: The rule is manifest in this example, this yeare 1631. I loke and finde the Epact 7. I would know the age of the moone the 18 day of Iune. I recken how many moneths it is from March, reckening March for one, and I finde it 4 months: then I take and adde all these together, that is to say, 7 for the Epact, and four for the moneths (that is to say, March, Aprill, May, Iune;) and then 18 for the day of the moneth, and all commeth to 29: So that you may conclude, that the moone is 29 dayes old, and changed 29 dayes before.

To know the age of the Moone by the number of the Epact.

The third Chapter treateth how to know by the age of the Moone, what houre it doth flow, or is full Sea at any place, where you doe know what Moone maketh a full sea.

NOw by the age of the Moone you may know at what houre it is a full sea, in any place where you doe know what Moone maketh a full sea, which rule commonly the seamen call, the shifting their sunne and moone; and many waies there be to doe it, for thus they may doe it: let them

To know the alteration of the Tides in 24 houres. An ensample for the full sea vpon the lands end for euery day of the age of the Moone.

diuide one houre into fiue parts, and then take foure of those parts, and put the first part away, that serueth for the alteration of the Moones course in 24 houres, and the foure fift parts of an houre are 48 minutes, and the fift part of an houre is 12 minutes. A flood and an ebbe doth alter 24. minutes forwards: as thus for example: it floweth at 12 of the clocke at the lands end vpon the change day, the Moone being in the South, at all times a full sea. The Moone being one day old, it floweth 12 of the clocke, 48 minutes: two dayes old, it floweth at one of the clocke, 36 minutes: three dayes old, it floweth at 2 of the clocke, 24 minutes: 4 daies old, it floweth 3 of the clocke, 12 minutes: fiue dayes old, it floweth 4 of the clocke iust, 6 dayes old, it floweth 4 of the clocke 48 minutes: seuen daies old, fiue of the clocke, 36 minutes: eight dayes old, 6 of the clocke 24 minutes. 9 dayes old, seauen of the clocke 12 minutes: ten dayes old, it floweth 8 of the clock iust, 11 dayes old, 8. of the clocke 48 minutes, 12 dayes 9 of the clocke, 36 minutes, 13 daies old, 10 of the clocke. 24 minutes, 14 dayes old, it floweth 11 of the clocke 12 minutes, 15 dayes old, it floweth 12 of the clocke iust, then begin the full Moone: and so begin againe as you did before at one day old, and so forth. For to finde the course of the tides is nothing else but to adde for euery day of the age of the Moone 48 minutes, and by this account you may at all times know at what a clock it doth flow, by putting to euery flood and ebbe 24 minutes, and to 2 floods, & 2 ebbes putting to 48 minutes.

To shift the Sunne and the Moone by the points of the Compasse.

Now furthermore, the sea-men vse to make their accounte by this meanes (but it is all one) they doe allow for euery day of the age of the Moone, one point and three minutes: for a point of the compasse containeth 45 minutes, that is 3 quarters of an houre. Then they put three minutes to 45 minutes, which make 48 minutes, the said 3 minutes is the 15 part of a point, & from the change to the full is 15 days, so that (the halfe compasse being 16 points) they break the odde point into 15 parts, & that commeth to 3 minutes,

so

So that the alteration of the tides, for euery 24 houres, bee 28 minutes, or 4 fifth parts of an houre: Wherefore there shall follow a table of tides, about certaine places of this realme: for euery Moone containeth 29 dayes, 12 houres, 44 minutes from change to change: the whole contents of the houres of the moone, bee 708 houres, and 44 minutes. And there are in euery yeere 12 changes of the moone: and the yeere containeth 365 dayes, 5 houres 49 minutes. Yet some doe affirme to be odde sixe houres, but there lacketh 11 minutes in the Tropicall yeere. Likewise in the yeere bee 12 monethes agreeable to the 12. Moones: the 12 Moones containe but 354 dayes, so that there bee 11 dayes more in the yeere, than there be in the 12 moones. The yeere also is diuided into 12 monthes, which monethes haue taken their names at the will & pleasure of men: as first January was so called of Ianus, who had two faces: for the moneth of January beholdeth the end of the yeere past, and the beginning of the yeere to come. Februarie tooke his name of certaine Romane sacrifices, called Februa. March is so called of Mars, for Romulus so named it, after the name of his father. Aprill comes of Aperio, because that then the earth is opened. May, of Maia, the mother of Mercurie. June so called by preparing the yong men to the warre. July, of Iulius Cæsar: And August, of Augustus Cæsar, for in that moneth hee entred the Consulship: then the rest of the monethes tooke their names of their number from March. Now in these 12 monethes, which make the yeere, the Sunne doth passe or goe through the Zodiacke called the 12 Signes, which is the occasion of the yeere: for this is to be noted, that the Sunne as I sayd before, doth goe by his naturall mouing in 365 dayes, 5 houres, 49 minutes, through the Zodiacke, containing 360 degrees, his course being from the West into the East, againe the course of Primum mobile, or first moner, being moued by the mighty prouidence of God, which maketh the 24 houres: and so doe all the 7

The Contents of the number of dayes and houres in one moone, the houres in euerie moone bee 708:44. minutes.

The content of a yeare is 365. dayes, 5. hours 49 minutes.

How the moneths tooke their names.

The Zodiacke containeth 360 degrees.

The moving of 24. houres.

lights or Planets, except that it be in their retrogradation: but the Sunne and Moone be neuer retrograde, as the other fiue Planets or lights be. And this is to be noted, that the Moone goeth faster then the Sun, for she goeth through the whole Zodiacke in twentie seuen dayes & eight houres almost. Now in that same time the Sun is remoued by his naturall mouing from that place of the Zodiacke neere twenty seauen degrees: & then because that the Moone hath not found the Sun there, it is two daies, four houres, and foure and forty minutes more, before that the Moone ouertaketh the Sunne againe; so by that meanes, it is 29. dayes, twelue houres, and foure and forty minuts betweene the change of the Moone, and the next change, throrow the yeere, although that the Moone may change somtime in lesse time, & sometime in longer time, that is by the meanes of the three motions of the Moone, that is to say, her swift motion, and her meane motion, and her slow motion, which groweth by the meanes of the Moones Auge or opposition thereof. The Moone being in Auge goeth but little more then 12 degrees in 24 houres. And in the opposition of Auge neere 15 degrees in 24 houres, and in her meane or equall motion 13 degrees, 12 minutes. So this is the occasion why sometime the Moone may change sooner, or be detracted longer then the time of 29 dayes, 12 houres, and 44 minuts. This point of Auge is moueable, and doth passe throrow the Zodiacke in the time of 19 yeers: and it causeth sometime the full of the Moone to happen sooner or later. In like manner also the quarters of the Moone with all the other aspects that the Moone hath with the Sunne, or any other of the Planets, according to the Moones motion: In like manner (by the meanes of the three motions of the Moone) sometime the Moone goeth more then one point and 3 minutes in 24 houres, and sometimes lesse then one point and 3 minutes, as this for example: the Moone being in her slow motion, goeth but little more then 12 degrees in 24 hours, yea and sometimes lesse, and then the Sunne in that

The time that the Moone goeth thorow the 12. signes.

The three motions of the Moone.

Of Auge.

The cause why the moone changeth rather or later:

The moone goeth in 24 hours sometimes more degrees, and sometime fewer degrees.

that time doth goe one degree: and then is there but 11 degrees betweene the Sunne and the Moone, (that is but 44. minutes.) So that the Moone is not one point in 24 houres from the Sunne. But being in her swift motion she goeth neere 15 degrees in 24 houres, and the Sunne goeth one degree in that time; so that there is 14 degrees in 24 hours betweene the Moone and the Sunne, (that is 56 minutes) which is a point, and 11 minutes. Wherefore I doe thinke it very necessary for to shew somewhat of the Moones motion, that they may know when that the Moone is eyther in her swift motion, or her slow motion; for that I doe know that there is not in respect, any sea-man that doth know it, because commonly they haue not sea-men that haue any sight or knowledga in the Moons Theorickes: therefore let them note these these few wordes following.

The Moone is not one point asunder from the Sun in 24 houres.

Additions.

Seeke out in the Ephemerides the name of the moneth wherein you would knew the swiftnesse or slownesse of the Moones course. In the vttermost columne answering to that moneth towards the right hand, you shall find the words Apog. and Perige: whereof the first signifieth the Auge of the Moone, the other signifieth the opposition of the Auge.

The day of the moneth which standeth against the word Apog: is it whereon the moone is slowest; the other against which the word Perige doth stand, is it wherein the Moone is swiftest. The which thing you may easily proue true in this maner. Right against the word Apog: seek out the place of the Moone toward your left hand vnder the Character of the Moone; subduct that out of the next number following (by putting thirtie degrees vnto that which followeth, if neede so require) and note the remainder. In like maner against the word Perige: seeke out the place of the Moone, and subduct it out of the next number following, compare this remainder with the former, and you shall alwayes find it to be the greater, whereby you may conclude the Moone then to be in her swiftest motion. The like may be wrought by

by any common Almanackes by ſubducting the degrees which the Moone poſſeſſeth the firſt day of the moneth out of the degrees which ſhe poſſeſſeth the ſecond, and ſo conſequently going on from the ſecond to the third, foureteene times together, vntill you finde the greateſt or the leaſt remainder. Where you finde the greateſt remainder in that ſigne, and on that day the Moone is in her ſwifteſt motion, and in the oppoſition of her Auge, and 14 dayes after ſhee will be in her ſloweſt motion, in her Auge: but when you finde the leaſt remainder, there the Moone is ſloweſt, and 14 daies after ſhe will bee in her ſwifteſt motion: This rule is vnfallible, and therefore is to bee followed rather then that which being grounded vpon the Prime, is moſt vncertaine. It is moſt neceſſary for ſea-men to ſknow this ſwiftneſſe or ſlowneſſe of the Moone in diuers reſpects, for if that the moone bee in her ſwift motion, then it cauſeth the change, quarter, or full of the Moone to be the rather. But contrariwiſe, when that the moone commeth from her ſlow motion, then that doth detract the time the longer before the Moone doth change, or is at the full, or any other aſpect.

And thus much I haue ſaid of the Moones motion: for that ſome ſeamen will take vpon them to correct the Almanackes as touching the change and quarters of the moone; holding this opinion, that euery moone ought to be equall in the number of the daies and houres: and the full moone to be iuſt the halfe contents. And the quarters in like manner, the iuſt fourth part in dayes and houres, ſo that ſome of them will take vpon them to tell (by the rule of the Epact,) the true houre of the change, quarters, and full of the moone: Wherein they are notably deceiued.

Error of Mariners.

Againe, ſometime in the yeere you ſhall ſee the moone rather then at ſome other time, as this for example.

From Ianuary to Iune, you ſhall ſee the moone within foure and twenty houres after the change, becauſe ſhe hath

North

Northy declination of the Sunne, and maketh a bigger Arch then the Sunne.

From July to December, you shall not see the Moone three dayes after the change, because her declination is to the South part of the Sunne. but you may see her in foure and twentie houres before her change. Now the sea men doe imagine a Prime day, which is the halfe quarter of the moone: that is, when the moone is three dayes & eighteene houres old, (the moone being then foure points to the Eastward of the Sunne, which is three houres:) the same rule may they in like case observe when the moone is past the full three dayes and eightéene houres, and also in the middes of the quarters.

Heere followeth a Table of Tides.

FIrst, the Mone South or North, on Lands end full Sea.

The Moone South and by East, at the Goze end full Sea.

The moone South Southwest, betwéene holy Iland and Tinemouth, full sea.

It floweth betwéene Tinemouth and Flamborough head, Southwest and Northeast moone.

It floweth betwéene Flamborough head, and Bridlington in the Bay, a Southwest and by West moone.

The moone in the West southwest, betwéene Bridlington and Laurenas, full sea.

It floweth betwéene Laurenas and Cromer all along the West, an East and West moone.

It floweth betwéene Cromer and Yarmouth Rode; to Laystow North Rode, a Southeast moone.

It floweth betwéene Laystow Rode and Orfordenas, a Southeast and by South Mone.

It floweth betwéene Orford and Orewell waues, a south Southeast Moone.

It

It floweth betweene the Nas and the Ware head of Colne, a south and by East moone.

It floweth at the Spittes, and at the Sheue, and all alongst the Swinne, a south Wone.

At the West end of the Noze, a south and by west moone, full sea.

It floweth at Graueſend, a south southwest moone.

It floweth at London bridge, a southwest moone.

It floweth at the North Foreland, a south southeast mone, and so alongst the coast till you come to Bechey. And in the Offing from the North Foreland to the South Foreland, it runneth halfe tide. And from the south Foreland to the Nas, the tide runneth halfe tide halfe quarter. And from the Nas to Fairely, it runneth halfe tide: and from Fairely to Beche, it runneth quarter tide vnder other.

It floweth to the Westward of Beche, a kenning, a southeast and by south Wone.

It floweth at Portesmouth, a South and by East moone.

It floweth at S. Clens a south southeast moone.

It floweth on the sea side of the Iland, a southeast and by south mone: and so on the land, and at the Nædles, and runneth quarter tide in the Offing.

It floweth at Poole in the hauen a Southeast moone.

It floweth at Waymouth: an East and West moone.

It floweth at Portland: a southeast moone.

It floweth from the West part of Portland, till you come vnto Plimmouth, an East and West moone.

It floweth on the shore from Plimmouth to the Lyzard, a west and by south moone. And in the Offing a southeast moone.

It floweth at Mounts Baye: an east and west moone.

It floweth at Selly: West and by south moone.

It floweth at the lands end of Scilse: a West southwest moone.

It floweth all alongst the coast vp to Brikstow, and the coast

coaſt of Ireland, from Waterford to Kinſale, a Weſt and by South Moone.

Furthermore It floweth (for the moſt part) from the pole head of Bardeaux all alongſt the coaſt of Biskey, Galyza, Portingale, till you come to the ſtreights of Peliga, a ſouthweſt and Northeaſt moone.

It floweth at Flushing, a ſouthweſt and by ſouth Moone.

It floweth at Antwerp, an Eaſt and Weſt Moone.

It floweth all alongſt the coaſt of Flanders, from the Wildings to Calys, a ſouth and by Eaſt Moone: and ſo runneth halfe tide vnder the other.

Now there is one ſpeciall thing to be noted, and that is this: It floweth one point of the Compaſſe more in the Spring Tides, then it doth in any of the quarters of the Moone, (ſo that it bee a Riuer where there is any indraft, hauing diſtance from the ſea) when there is neither rage of windes, nor any cauſe either to hinder or further the ſaid effect.

It will flow a point of the compaſſe more in the ſpring tides than in the neap.

As for example, thus: It floweth at Grauſend, at the change of the Moone or full, a ſouth ſouthweſt moone. But in any of the quarters of the Moone it ſcant floweth, a ſouth and by weſt Moone, and this is generall for euer.

Tides in a riuer that hath any diſtance vnto the ſea.

The fourth Chapter treateth of the Sunne and Moones courſe in the Zodiacke: and how you ſhall know what houres the Moone ſhall riſe and ſet, and at what point of the Compaſſe, with other neceſſary things.

FVrthermore, the Sun (by his naturall moouing through the 12 ſignes in the Zodiacke in the yeere) doeth cauſe the height & lowne of his declination which is neceſſary for the ſea-faring men to know, the which declinatiõ they do take from Equinoctiall to Equinoctiall. And this is to be noted, that

that as the Sunne hath declination, in like manner hath the Moon, for by her declination and the sunnes is knowne the time of her shining or abiding aboue our Horizon.

To know how long the moon shineth.

The Sunne or Moone in the first minute of Aries, do rise East, and set West, and shine twelue houres. In the first minute of Taurus, they rise neere the East Northeast, and set neere the West North west, and shine somewhat more then 14 houres. In the signe of Gemini, they rise nere the Northeast and by East, and they set neere the Northwest and by West, and shine necre sixteen houres. In the signe of Cancer, the first minute, they make their greatest declination to the North-wards, and they rise neere the Northeast, and set neere the Northwest, and shine nere 16. houres and a halfe. In the first minute of Leo, (descending towards the Equinoctiall) as they did in Gemini. And in the signe of Virgo, as they did in Taurus. And in the first minute of Libra, Equinoctiall: beginning such declination, as in Aries. And in the first minute of Scorpio they rise nere the East south east, and set nere the west southwest, and shine ten houres. In the first minute of Sagitarius, they rise nere the southeast and by East, and set nere the the southeast and by west, and shine eight houres. In the first minute of Capricornus, they haue their greatest declination to the south, and begin to returne to the Equinoctiall, rising neere the southeast, and setting nere the southwest, and shine seauen houres ½ a halfe: In the first minute of Aquarius, as in Sagitarius: In the first minute of Pisces, as in Scorpio:

To know when the sunne riseth and setteth.

By this meanes you may know the time of the sunnes rising and setting, in this manner: Diuide the time of the sunnes shining, or continuance aboue the Horizon into two equall parts: the one part sheweth the time of his setting: & it being subducted from 12: sheweth the time of his rising: As for example: Because the sunne being in Cancer, as is aforesaid, shineth 16: houres and a halfe; therefore I diuide that time into two equall parts (whereof the one is 8.

houres

houres and one quarter,) and say that the sun setteth a quarter of an houre after eight, this number being subducted from 12. declareth the sunne to arise three quarters after three in the morning.

Also by this rule you may knowe the time of the rising and setting of the Moone for euer. But before I say any more of that matter, here is to bee noted, that when the Moone changeth, then the Sunne and she are both in one degree of the Eclipticke, and therefore they arise at one time, and vpon one point of the Compasse, and continue aboue the Horizon both a like time. When the Moone is at the full, the Sunne and shee are opposite one against the other, and fire signes asunder, so that she ariseth at the same time when the Sunne setteth, and setteth when the sunne ariseth, but vpon the contrary point of the Compasse. And if the time of the continuance of the Sunne aboue the Horizon be subducted out of 24. houres, the remainder sheweth the continuance of the Moone aboue the Horizon. The quarters bee when the sunne and moone are 3. signes asunder, that is 90. degrees. Moreouer from the change of the moone to the full, the moone ariseth after the Sunne, and setteth after him: But from the full to the change, the Moone ariseth and setteth before the Sunne. Therefore if at these intermiddle times betweene the change and the full, and the full and the change againe, you desire to know the time of the rising and setting of the moone note this: I haue shewed you before, speaking of the shifting of the sunne and Moone, that euery day of the age of the Moone, the moone goeth Eastward one point and three minutes, so that you must loke how many dayes the Moone is old, then put so many points, and so many three minutes together, and conuert them into houres: if the number be lesser then twelue, it sheweth how long the moone ariseth after the sunne. But if the said number be more then 12. cast away twelue, and the remainder sheweth how long the Moone ariseth before the Sunne. The

To know when the Moone riseth & setteth.

time

time of her arising being once knowne, the time of her setting is easily known. For as many houres as she continueth in the East aboue the Horizon before shee commeth to the South, so many hours shee continueth in the West before shee setteth vnder the Horizon after shee is past the South: as for example thus. In March alwayes the sunne is in Aries, then the Moone being in her first quarter, is fiue houres to the Eastward of the sun, then the Moone must needes bee in Cancer. Then shineth the Moone in our Horizon 16 hours and a halfe, and is South at fiue of the clocke, and shineth 8 houres and a quarter after 6 of the clocke So that she setteth at 2 of the clocke and a quarter of an houre past. and riseth in the day 8 houres and a quarter before 6 of the clocke, that is at 9 of the clocke, and 3 quarters of an houre past. Now at the last quarter in March, then the moone must needs be in Capricornus, and shineth but 7 houres and a halfe, and is south at 6 of the clocke in the morning, & riseth 3 houres and 3 quarters before, that is 2 of the clocke & a quarter of an houre past in the morning, and she setteth by day at 9 of the clocke, and 3 quarters of an houre past: and this rule will serue for euer, without any great errour. But yet there is a further matter for the exact doing, which is the latitude of the Moone from the head or taile of the Dragon.

Example of the Moones rising & setting.

And now for to shew vnto you when that the Mone is with the head and the taile of the Dragon, as I haue in the third Chapter said vnto you, there are but few seamen that doe knowe the Mones Theorickes, for they cannot tell when that the Mone is in her swift or slow motion. So in like maner it is necessary for to knowe the Moones latitude from the line Ecliptick, & also of which side of the line Ecliptick, which is knowen by the head or taile of the dragon: For when that the Mone hath passed 90 degrées from the head of the Dragon, then the Mone hath latitude 5 degrées vnto the North parts of the line Ecliptick; and also if that the Mone be 90 degrées from the Dragons taile, then the Mone hath latitude 5 degrees vnto the south parts of the line Ecliptick.

The Moone hath Latitude.

So

So that the Dragons head is no other thing, but the crossing or passing of the Mone from the South parts vnto the North part of the line Ecliptike. So in like manner the Dragons taile is the crossing or passing of the Mone ouer the line Ecliptieke from the North part vnto the South parts of the line Ecliptieke. The effects hereof is this, if the Mone doth come with the head or taile of the Dragon at hir opposition or full then she shall bee eclipsed, because the shadow of the earth is seene vpon the Mone, and these Eclipses be generall throw the face of the whole earth, if that the Mone be aboue the Horison. And in like maner, if that the Mone doth come with ẏ head or taile of the Dragon at the coniunction or change of the Mone, then the Sunne is eclipsed, for that the Mone commeth betweene the Sunne and the earth: but these eclipses are not generall, for that the Diameter of the earth is more then fiue times the Diameter of the Mone: and also the Mone commeth very neere vnto the earth in respect of the great distance that the Sunne is from the earth, so that the Sun may be eclipsed in one place but not in another, which doth happen by the Mones Paralax as afore I haue shewed &c. And now for to know where the Dragons head is, note this, when that the Prime is one, then the Dragons head is in the first part of Aries as the point of Auge is, But their motions are contrarie: For as the point of Auge is Aries and from thence commeth into Taurus, and so successiuely proceedeth throw the 12. signes in 9 yers, so the Dragons head doth passe through the 12 signes in 19 yers backwards, for being in Aries, it commeth into Pisces, and thence into Aquarius, &c. So that in 9 yeres & a halfe, the Dragons head is in Libra, and doth meete with the point of Auge, &c.

And now for to know the Mones Latitude marke this, the Prime one, the Dragons head is in Aries, whereby it may be inferred that the Mone in Cancer, is 90. Degrees from the Dragons head, and hath her farthest distance from the line Ecliptieke, that is, fiue degres. So that the Mone

decline fiue degrees more vnto the Northwards than the Sunne doth, and her whole declination is 28. degrées and a half from the Equinoctiall, touching the Dragons taile, which is alwaies opposite vnto the Dragons head, ỳ Prime being one, the Dragons taile is in Libra. Item the Mone passing Cancer commeth nære the Ecliptick, and in Libra she crosseth the line Eclipticke, and when she is come into Capricorne, then she is fiue degrées vnto the Southwards of the line Eclipticke, and decli neth 28 degrees and a halfe vnto the Southwards of the Equinoctiall. So that the Mone doth decline in all (reckning not with the Mones Paralare) 57 degrees the Prime being one, in nine yéars and a halfe, the Dragons head shall be in Libra, and the taile in Aries, & then the Mone in the signe of Libra, shall passe ouer the line Eclipticke from the South part to the North part. So that the Mone in the signe of Capricorne, is fiue degrées vnto the North of the line Eclipticke, and then she doth decline but 18. degrées and a halfe from the Equinoctiall to the South parts, and so in the signe of Aries, the Mone shall passe ouer the line Eclipticke from the North vnto the South and then in Cancer the Mon is fiue degrées vnto the South of the line Eclipticke, and doth decline 18. degrees vnto the North parts of the Equinoctial, so that the Mones whole declination, is but 37 degrees. So when the Prime is one, the declination of the Mone is more by 20 degrées, then when the Prime is betweene nine and ten yéares, and when the Prime is nére fiue, then the Dragons head is in Capricornus. And when the prime is 14. or 15. the Dragons head is in Cancer. So that in 19 yéars the Dragons head doth passe through the twelue signes backwards.

Thus by knowing what the Prime is you may knowe where the Dragons head is, and also ỳ Dragons tayle, and then that knowne, you may know the Mones latitude from the line Eclipticke and of which side: For when the Mone is in the Dragons head, then she passeth ouer from the south vnto the north part, but when she is with the Dragons taile then

then she passeth ouer from the North vnto the South part of the line Ecliptick, and then when that the Moone is halfe way betweene the head and the taile of the Dragon, then is she fiue degrees in Latitude from the line Ecliptick, that is to say, if that shee come from the head of the Dragon, she is fiue degrees on the North side, if from the taile, then is she fiue degrees on the South side, of the line Ecliptick, and this I doe thinke sufficient for instruction. Here (as before) I could wish that Seafaring men or others, would not leane too much vnto these rules of the Prime concerning the finding out of the true place of the Dragons head or taile, because they are vncertaine, but I would wish them to sticke vnto the Ephemerides, wherein to saue their labour these things are seuerally set downe with more certainty.

Yet these is one thing which I would Seafaring men should consider, although a great nũber be expert in that, yet it is meet to be spoken of as this. The Sunne being in Cancer, or Moone in like manner, or in Gemini, or any time when the Sunne or Moone hath North declination, they will set their Compasse before them, & when they see the Sun giue an East shadow they will say that it is six of the clocke; whereas if the Sunne be in *Cancer*, it is not much past fiue of the clocke, and the farther they are to the Southwards, the more they do erre. And in like case the moone being in Cancer, whẽ they do see the moone giue an East shadow by their compasse, they well say the moone is west, but they do not consider, that the Sun & the Moone being in Cancer, commeth too neere the Zenith, or verticall point right ouer our head, (which is the very height of their declination) that the position of their shadow can hardly be discerned, therefore they must iudge the east or west frõ the pole or north star if they will iudg truly.

You cannot know what a clocke it is by the Compasse, the Sun being in the North signes

Errour of the shadow of the Moone.

Wherefore I do much commend the Equinoctiall dyals for the exact truth, for they cannot know the truth by their Compasse, if that the Sunne or Moone, or any other starre, haue any great declinatiõ being in Cancer, & you must consider this in like manner. The Sun hauing North declinatiõ

The Equinoctiall dials be very good.

the farther you do go to the Northwards, the longer is your day and the shorter is your night and towards the Southwards the shorter dates and longer nights.

As touching the length and shortnes of the day and night.

Now contrariwise, the Sunne having South declination, the more to the Northwards, the shorter dates and the longer nights, the further to the Southwards, the longer dates and shorter nights; and under the Equinoctiall the nights and dates al one; but this rule that I haue giuen you is for London, or any other place that hath North Latitude for the eleuation of the Pole Artick.

¶ The fifth Chapter is of a Table of declination, commonly called of Sea-faring men, A Regiment of the Sun, exactly calculated for foure yeeres, and will serue for sixteene yeeres, for euery day of the Moneth.

AND in like manner as I haue said somewhat of the Moones motion, so doe I thinke it conuenient for to say some-what of the Sunnes motion, for that it is necessary for Sea-men for to knowe the Sunnes place in the Zodiacke, whereby that they may calculate or count the Sunnes declination, truly, and (as I haue shewed before,) that the Sunne doth passe through the Zodiacke in 365. daies, fiue houres, 49. minutes, and hath three motions as the Moone hath. In the point of Auge is the Sunnes slow motions, and then the Sunne passeth or goeth but little more then fifty seuen minutes in 24 houres. & in the opposition of Auge, the Sunne passeth or goeth one degree and neere two minutes in 24. houres, that is more by fiue minutes almost in his swift motion then in his slow motion. The point of Auge is now in this age of the world in the signe of Cancer, but not in the Solsticiall point, where

where that the Sun hath his greateſt declination, and alſo the oppoſition of Auge is in Capricorne, but not there where the ſunne hath his greateſt declination. Now by the meanes of the three motions of the ſunne, it falleth out that the Equinoctiall points be not euen, for that there are more daies from the Equinoctiall of March, vnto the Equinoctiall of September, by neere nine dayes, then there is from the Equinoctiall of September, vnto the Equinoctiall of March, for that there is from the eleuenth day of March vnto the 14. day of September, 187. dayes, and there is but 178. dayes from the 14 day of September vnto the 11 day of March. And the reaſon is this as I haue ſaid before, becauſe that in the latter part of June the Sunne is in his ſlow motion, and alſo in the latter part of December, hee is in his ſwift motion: & this doe I thinke ſufficient for inſtructions in this matter, for that the Seamen haue no farther to doe with the Sunnes motion, but onely from the true place of the Sunne to ſeeke the true declination of it: and alſo the moſt part of ſeamen haue vſed Spaniſh Regiments, and thinking that thoſe would haue ſerued for euer, which is moſt contrary, for if that it be neuer ſo truely calculated, yet it groweth after twentie foure yeares vnto errour.

For as often as euery yeare of Beſſextilis doth come about, which is euery fourth yeare, the Sunne is ſooner in the Equinoctiall by more than halfe an houre, &c.

Now ſhall follow a Table of declination or Regiment for foure yeares, being calculated for the Longitude of 24. d. and will ſerue all Europe without much errour, or any other countrie or place that hath the ſame Longitude, as the moſt part of Africa, Ginnie, and thoſe parts to the Southwards, as farre as the Antartick Pole, ſerving for euery day of the Month, very neceſſary for them that doe vſe to trauaile either by ſea or by Land, & is one of the principal points in Nauigation, for long voiages; and the cauſe why I haue written this Regiment for the Sea, or Tables of declination, is for that I doe know that euery perſon that goeth vn-

Every person cannot calculate the sunnes declination.

to the Sea, as Master of a ship, hath not capacity to calculate the Sunnes declination, by the place of the Sunne, although they haue the Tables of declination, as the Ephemerides, or Martine Cortise, otherwise called the Art of Navigation. Wherefore I haue written these notes, and Regiment or Table of declination for foure yeres, and the first rowe towards your left hand, is the dayes of the Month: the next row, is the degrees of declination that the Sunne hath at the instant time of noone: and the third row is the odde minutes of declination belonging to the degrees.

Twice in the yeere the Sun hath declination 1577.

Now there be two times in the yere that the Sunne hath no declination, as this: For the first yere after Bissextilis, (which is in the yeere of our Lord 1633. the 10. day of March, the Sunne will be in the Equinoctiall, beginning North declination. And in like manner, the 13. day of September, the Sunne will be in the Equinoctiall beginning South declination, and also the second yere after Bissextilis, which is the yere of our Lord, 1634. the Sunne is in the Equinoctiall the 10. day of March, beginning North declination, and in like manner the 13. day of September, beginning South declination.

Furthermore, in the third yeare after Bissextilis, which is the yeare of our Lord 1635. the Sunne is in the Equinoctiall the 10 day of March, beginning North declination, and so in like manner the 13. day of September, beginning South declination.

Lastly, in the yeare of our Lord 1636. that is, the yeare Bissextilis it selfe; vpon the 10. day of March, the Sunne shall be in the equinoctiall, beginning North declination: and in like manner the 13. day of September, beginning South declination: Now these foure yeares being expired, you must begin againe at the first yeare after the yeere Bissextilis or leape yeere, as here doth follow for example. And so it will serue for twenty yeeres to come.

Yeeres

Yeere 1	Yeere 2	Yeere 3	Yeere Biſſextilis
1629	1630	1631	1632
1633	1634	1635	1636
1637	1638	1639	1640
1641	1642	1643	1644
1645	1646	1647	1648

To the Reader of this *Regiment.*

GEntle Reader, I haue painefully and truly calculated this Regiment for your vſe, and deſire you to perſwade your ſelfe ſo: If it ſhall ſeeme otherwiſe, either it ſo falleth out by meanes of your obſeruation, or in reſpect of the place in which you are, which may alter the place of the Sunne, and conſequently his declination diuerſly. Therefore if your expectation in ſearching the eleuation of the Pole by this Regiment be not fully anſwered, let not my labour be vnaduiſedlie reproned, leaſt I be diſcouraged; but let the fault remaine where it is.

I reſt Yours

Thomas Hood.

1633

Ianuarie.

South Declination.

Dayes.	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	164‹	1646	1647	1648
	Gr. ı	Gr. ı	Gr. ı	Gr ı
1	21,45	21,48	21,50	21,52
2	21,35	21,38	21,40	21,43
3	21,25	21,27	21,30	21,32
4	21,14	21,17	21,19	21,22
5	21, 3	21, 6	21, 8	21,11
6	20,51	20,54	20,57	21, 0
7	20,39	20,42	20,45	20,48
8	20,27	20,30	20,33	20,36
9	20,14	20,17	20,20	20,23
10	20, 1	20, 4	20, 7	20,10
11	19,47	19,51	19,54	19,57
12	19,33	19,37	19,40	19,43
13	19,19	19,23	19,26	19,30
14	19, 4	19, 8	19,12	19,15
15	18,49	18,53	18,57	19, 1
16	18,34	18,38	18,42	18,45
17	18,18	18,22	18,26	18,30
18	18, 2	18, 7	18,10	18,14
19	17,46	17,51	17,54	17,58
20	17,30	17,34	17,38	17,42
21	17,13	17,17	17,21	17,25
22	16,55	17, 0	17, 4	17, 8
23	16,38	16,42	16,47	16,51
24	16,20	16,24	16,29	16,33
25	16, 2	16, 6	16,11	16,15
26	15,44	15,48	15,53	15,38
27	15,25	15,30	15,34	15,20
28	15 6	15,11	15,15	15, 1
29	14,47	14,52	14,56	14,42
30	14,28	14,32	14,37	14,23
31	14, 8	14,13	14,18	14, 3

South Declination

South Declination

Februarie.

Dayes	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	1645	1646	1647	1648

South Declination.

	Gr. 1	Gr. 1	Gr. 1		Gr. 1
1	13,48	13,53	13,58		
2	13,28	13,33	13,38		
3	13, 7	13,12	13,17	1	14, 3
4	12,47	12,52	12,57	2	13,43
5	12,27	12,32	12,36	3	13,23
6	12, 6	12,11	12,16	4	13, 2
7	11,45	11,50	11,55	5	12,42
8	11,23	11,28	11,34	6	12,21
9	11, 2	11, 7	11,12	7	12, 0
10	10,40	10,45	10,51	8	11,38
11	10,18	10,24	10,29	9	11,17
12	9,56	10, 2	10, 7	10	10,56
13	9,34	9,40	9,45	11	10,34
14	9,12	9,18	9,23	12	10,12
15	8,50	8,55	9, 0	13	9,50
16	8,27	8,32	8,38	14	9,28
17	8, 5	8,10	8,15	15	9, 6
18	7,42	7,47	7,53	16	8,43
19	7,19	7,24	7,30	17	8,21
20	6,56	7, 2	7, 7	18	7,58
21	6,33	6,38	6,44	19	7,35
22	6,10	6,15	6,21	20	7,12
23	5,46	5,52	5,58	21	6,49
24	5,23	5,29	5,34	22	6,26
25	5, 0	5, 6	5,11	23	6, 3
26	4,36	4,42	4,48	24	5,40
27	4,13	4,19	4,24	25	5,17
28	3,50	3,55	4, 1	26	4,54
				27	4,30
				28	4, 6
				29	3,43

South Declination

	March				
	1	2	3	4	
	1633	1634	1635	1636	
	1637	1638	1639	1640	
	1641	1642	1643	1644	
	1645	1646	1647	1648	
	Gr. 1	Gr. 1	Gr. 1	Gr. 1	
1	3,26	3,32	3,37	3,20	South Declination.
2	3, 2	3, 8	3,14	2,56	
3	2,39	2,44	2,50	2,32	
4	2,15	2,21	2:27	2, 9	
5	1,51	1,57	2, 3	1,45	
6	1,28	1,33	1,39	1,21	
7	1, 4	1,10	1:15	0,57	
8	0,40	0,46	0:52	0,34	
9	0,17	0,22	0,28	0,10	
10	0, 6	0, 1	0: 4	0,13	Eequi-noctiall
11	0,31	0,25	0,19	0,37	
12	0,54	0,49	0:43	1, 1	
13	1,18	1,12	1: 7	1,24	
14	1,42	1,36	1,30	1,48	
15	2, 5	1,59	1,53	2,11	
16	2,28	2,23	2:17	2,35	North Declination
17	2,52	2,46	2,41	2:58	
18	3,15	3,10	3: 4	3,22	
19	3,39	3,33	3.27	3,45	
20	4, 2	3,56	3,51	4: 8	
21	4,25	4,20	4,14	4,31	
22	4,48	4,43	4,37	4,54	
23	5,11	5, 6	5,00	5,18	
24	5,34	5,29	5,23	5,41	
25	5,57	5,52	5,46	6, 3	
26	6,20	6,15	6: 9	6:26	
27	6,42	6,37	6,32	6,49	
28	7, 5	7,00	6,54	7,11	
29	7,28	7,22	7,17	7,34	
30	7,50	7,44	7,39	7,56	
31	8,12	8, 7	8, 1	8,18	

South Declination

North Declination

North Declination

Aprill

	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	1645	1646	1647	1648
	Gr. 1	Gr. 1	Gr. 1	Gr. 1
1	08,34	8:28	8,22	8,40
2	08,56	8:50	8,45	9, 2
3	09,17	9:12	9, 7	9,23
4	09,39	9:34	9,29	9,45
5	10,00	9:55	9,50	10, 6
6	10,21	10:16	10,11	10,27
7	10,42	10:37	10,32	10,48
8	11, 4	10:58	10,53	11, 9
9	11,24	11:19	11,14	11,30
10	11,45	11:40	11,35	11,51
11	12, 5	12: 0	11,55	12,11
12	12,25	12:20	12,16	12,31
13	12,45	12:40	12,36	12,50
14	13, 4	13: 0	12,55	13, 9
15	13,24	13:20	13,15	13,29
16	13,44	13,39	13,34	13,49
17	14, 3	13,58	13,54	14, 8
18	14,22	14,17	14,13	14,27
19	14,40	14 36	14,31	14,45
20	14,59	14,54	14,50	15, 4
21	14,57	15,12	15, 8	15,22
22	15,17	15,30	15,26	15,40
23	15,35	15,48	15 44	15,57
24	15,52	16, 5	16, 1	16,14
25	16, 9	16,22	16,18	16,31
26	16,27	16,39	16,35	16,48
27	16,44	16:56	16,52	17, 5
28	17,00	17,12	17, 9	17,21
29	17,16	17,28	17,25	17,37
30	17,32	17,44	17,41	17,53

North Declination

North Declination

	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	1645	1646	1647	1648
	Gr. 1	Gr. 1	Gr. 1	Gr. 1
1	18: 4	18,00	17,56	18, 8
2	18,19	18,15	18,11	18,23
3	18,33	18,30	18,26	18,38
4	18:48	18,44	18,41	18,52
5	19, 2	18,59	18,55	19, 6
6	19,16	19,13	19, 9	19,20
7	19,29	19,26	19,24	19,33
8	19,43	19,40	19,36	19,46
9	19:56	19:53	19,49	19,59
10	20, 8	20, 5	20, 2	20,11
11	20,20	20,17	20,14	20,24
12	20,32	20,29	20,16	20,36
13	20,44	20,41	20,38	20,47
14	20,55	20,52	20 49	20,58
15	21, 6	21, 2	21 0	21, 9
16	21:16	21,14	21,11	21,19
17	21:26	21,24	21:21	21,29
18	21,36	21,33	21,31	21,38
19	21,45	21,33	21,41	21,47
20	21,54	21,52	21,50	21,56
21	22, 3	22, 1	21,59	22, 5
22	22,11	22, 9	22, 7	22,13
23	22,19	22,16	22,15	22:21
24	22,26	22,24	22,22	22,28
25	22,33	22,32	22,30	22,35
26	22,40	22,38	22,37	22,42
27	22:46	22,45	22 43	22,48
28	22,52	22:51	22,49	22:53
29	22,57	23,56	22,55	22:59
30	23, 2	23, 1	23, 0	23, 4
31	33 7	23 6	23 5	23 8

North Declination

North Declination

June	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	1645	1646	1647	1648
	Gr. ı	Gr. ı	Gr. ı	Gr. ı
1	23,11	23,10	23, 9	23,12
2	23,15	23,14	23,13	23,16
3	23,19	23,18	23,17	23,19
4	23,22	23:21	23,20	23,22
5	23.24	23,24	23,23	23,25
6	23,26	23,26	23,25	23,27
7	23,28	23,28	23,27	23,29
8	23,30	23,29	23,29	23,30
9	23,31	23,30	23,30	23,31
10	23:31	23,31	23,31	23,31
11	23,31	23,31	23,31	23,31
12	23,31	23,31	23,31	23,31
13	23,30	23,31	23,31	23:30
14	23,29	23:30	23:30	23,29
15	23,28	23,28	23,29	23,27
16	23,26	23,26	23,27	23:25
17	23,24	23.24	23,25	23,23
18	23,21	23,21	23,22	23,20
19	23,18	23,18	23,19	23,17
20	23,14	23,15	23,16	23,13
21	23:10	23,11	23,12	23, 9
22	23, 6	23, 7	23, 8	23, 4
23	23, 1	23: 2	23, 3	23,59
24	22,56	22:57	22,58	22,54
25	22,50	22.52	22,53	22,49
26	22,44	22,46	22,47	22,43
27	22,38	22,40	22,41	22,36
28	22,31	22:33	22,35	22,29
29	22,24	22,26	22:28	22,22
30	22,17	22,18	22:20	22,14

North Declination

North Declination.

Dayes	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	1645	1646	1647	1648
	Gr. ′	Gr. ′	Gr. ′	Gr ′
1	22, 9	22,11	22,13	22, 7
2	22, 1	22, 3	22, 4	21,58
3	21,52	21,54	21,56	21,49
4	21,43	21,45	21,47	21,40
5	21,33	21,36	21,38	21,31
6	21,24	21,26	21,28	21,21
7	21,14	21,16	21,18	21,11
8	21, 3	21, 6	21, 8	21, 0
9	20,52	20,55	20,57	20,49
10	20,41	20,44	20,46	20,38
11	20,29	20,32	20,35	20,26
12	20,18	20,20	20,24	20,14
13	20, 6	20, 8	20,12	20, 2
14	19,53	19,56	19,59	19,49
15	19,40	19,43	19,46	19,36
16	19,27	19,30	19,33	19,23
17	19,13	19,17	19,20	19, 3
18	18,59	19, 3	19, 6	18,55
19	18,45	18,49	18,52	18,41
20	18,31	18,34	18,38	18,27
21	18,16	18,19	18,23	18,12
22	18, 1	18, 4	18, 8	17,57
23	17,45	17,49	17,53	17,41
24	17,30	17,33	17,37	17,25
25	17,14	17,17	17,21	17, 9
26	16,58	17, 1	17, 5	16,53
27	16,41	16,45	16,49	16,36
28	16,24	16,28	16,32	16,19
29	16, 7	16,11	16,15	16, 2
30	15,50	15,54	15,58	15,45
31	15,32	15,37	15,41	15,27

North Declination.

August

North Declination.

Dayes	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	1645	1646	1647	1648
	Gr. I	Gr. I	Gr. I	Gr I
1	15,14	15,19	15,23	15,10
2	14,56	15, 1	15, 5	14,51
3	14,38	14,43	14,47	14,33
4	14,20	14,24	14,29	14,14
5	14, 1	14, 5	14,10	13,56
6	13,42	13,46	13,51	13,37
7	13,23	13,27	13,32	13,17
8	13, 3	13, 7	13,12	12,58
9	12,44	13,48	12,53	12,38
10	12,24	12,28	12,33	12,18
11	12, 4	12, 8	12,13	11,58
12	11,44	11,48	11,53	11,38
13	11,23	11,28	11,33	11,17
14	11, 2	11, 7	11,12	10,57
15	10,42	10,47	10,52	10,36
16	10,21	10,26	10,31	10,15
17	9,50	10, 5	10,10	9,54
18	9,38	9,44	9,49	9,33
19	9,17	9,22	9,27	9,11
20	8,55	9, 1	9, 6	8,50
21	8,34	8,39	8,44	8,28
22	8,12	8,17	8,23	8, 6
23	7,50	7,55	8, 1	7,44
24	7,28	7,33	7,39	7,22
25	7, 6	7,11	7,16	7, 0
26	6,43	6,49	6,54	6,37
27	6,21	6,26	6,32	6,15
28	5,58	6, 4	6, 9	5,52
29	5,36	5,41	5,47	5,29
30	5,13	5,18	5,24	5, 7
31	4,50	4,55	5, 1	4,44

North Declination.

Dayes	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	1645	1646	1647	1648
	Gr. ′	Gr. ′	Gr. ′	Gr. ′
1	4,27	4,33	4,38	4,21
2	4, 4	4,10	4,15	3,58
3	3,41	3,47	3,52	3,35
4	3,18	3,24	3,29	3,12
5	2,15	3, 0	3, 6	2,48
6	2,31	2,37	2,43	2,25
7	2, 8	2,14	2,19	2, 2
8	1,45	1,50	1,56	1,38
9	1,21	1,27	1,32	1,15
10	0,58	1, 3	1, 9	0,51
11	0,34	0,40	0,46	0,28
12	0,11	0,16	0,22	0, 4
13	0,12	0, 7	0, 1	0,19
14	0,36	0,30	0,25	0,42
15	0,59	0,54	0,4	1, 6
16	1,23	1,17	1,12	1,29
17	1,46	1,41	1,35	1,53
18	2,10	2, 4	1,59	2,16
19	2,33	2,28	2,22	2,40
20	2,57	2,51	2,45	3, 3
21	3,20	3,15	3, 9	3,27
22	3,44	3,38	3,32	3,50
23	4, 7	4, 2	3,56	4,14
24	4,30	4,25	4,19	4,37
25	4,54	4,48	4,42	5, 0
26	5,17	5,11	5, 6	5,23
27	5,40	5,35	5,29	5,46
28	6, 3	5,58	5,52	6, 9
29	6,26	6,21	6,15	6,32
30	6,49	6,44	6,38	6,55

North Declination. Equinoctiall. South Declinations.

North Declination. South Declination.

South Declination

	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	1645	1646	1647	1648
	Gr. 1	Gr 1	Gr. 1	G. 1
1	7,12	7, 6	7, 1	7,18
2	7,35	7,29	7,24	7,41
3	7,57	7,52	7,46	8, 3
4	8,20	8,14	8, 9	8,26
5	8,42	8,37	8,31	8,48
6	9, 5	8,59	8,54	9:10
7	9,26	9,21	9,16	9,32
8	9.48	9:43	9,38	9,54
9	10,10	10, 5	9,50	10,16
10	10,32	10,27	10,21	10,38
11	10:54	10,48	10:43	10,59
12	11,15	11,10	11, 5	11,21
13	11:36	11,31	11,26	11,42
14	11,57	11,52	11,47	12, 3
15	12,18	12,13	12, 8	12,24
16	12,39	12:34	12,29	12,44
17	12:59	12,54	12,49	13, 4
18	13,19	13:15	13, 9	13,25
19	13,39	13,35	13,30	13,45
20	13,59	13,54	13,50	14, 5
21	14,19	14,14	14, 9	14,24
22	14,38	14,34	14,29	14,44
23	14:57	14,53	14,48	15, 3
24	15,16	15,12	15, 7	15,21
25	15,35	15:31	15,26	15,40
26	15,53	15,49	15,44	15,58
27	16:11	16, 7	16, 3	16,16
28	16,29	16,25	16,21	16,34
29	16,47	16,43	16,38	16,52
30	17, 4	17. 0	16,56	17, 9
31	17,21	17:17	17,13	17,26

South Declination

South Declination.

Dayes	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	1645	1646	1647	1648
	Gr. ′	Gr. ′	Gr. ′	Gr ′
1	17,38	17,34	17,30	17,42
2	17,54	17,50	17,46	17,58
3	18,10	18, 6	18, 2	18,14
4	18,26	18,22	18,18	18,30
5	18,41	18,38	18,34	18 45
6	18 56	18,53	18,49	19, 0
7	19,11	19, 8	19, 4	19,15
8	19,26	19,22	19,18	19,29
9	19,40	19,36	19,33	19,43
10	19,53	19,50	19,47	19,57
11	20, 7	20, 4	20, 0	20,10
12	20,20	20,17	20,13	20,23
13	20,32	20,29	20,26	20,36
14	20,44	20,42	20,39	20,48
15	20,56	20,53	20,51	20,59
16	21, 8	21, 5	21, 2	21,11
17	21,19	21,16	21,13	21,22
18	21,29	21,27	21,24	21,32
19	21,39	21,37	21,35	21,42
20	21,49	21,47	21,45	21,52
21	21,59	21,56	21,54	22, 1
22	22, 8	22, 5	22, 3	22,10
23	22,16	22,14	22 12	22,18
24	22,24	22,22	22,20	22,26
25	22,32	22,30	22.28	22,34
26	22,39	22,37	22,35	22,41
27	22,46	22 44	22,42	22,47
28	22,52	22,50	22.49	22,53
29	22,58	22,56	22,55	22,59
30	23, 3	23, 2	23, 1	23, 4

South Declinations.

December

South Declination

	1	2	3	4
	1633	1634	1635	1636
	1637	1638	1639	1640
	1641	1642	1643	1644
	1645	1646	1647	1648
	Gr. ′	Gr. ′	Gr. ′	Gr. ′
1	23, 7	23, 7	23, 6	23, 9
2	23,12	23,11	23,10	23,13
3	23,16	23,15	23,14	23,17
4	23,20	23:19	23,18	23,21
5	23,23	23,22	23,21	23,24
6	23,25	23,25	23,24	23,26
7	23,28	23,27	23,27	23,28
8	23,29	23,29	23,29	23,30
9	23,30	23,30	23,30	23,31
10	23:31	23,31	23,31	23,31
11	23,31	23,31	23,31	23,31
12	23,31	23,31	23,31	23,31
13	23,30	23,30	23,31	23:30
14	23,29	23:29	23:30	23,29
15	23,27	23,28	23,28	23,27
16	23,25	23,26	23,26	23:24
17	23,23	23,23	23,24	23,21
18	23,19	23,20	23,21	23,18
19	23,16	23,17	23,18	23,15
20	23,12	23,13	23,14	23,11
21	23: 7	23, 8	23, 9	23, 6
22	23, 2	23, 3	23, 5	23, 1
23	22,57	22:58	23, 0	22,55
24	22,51	22:52	22,54	22,49
25	22,45	22 46	22,48	22,43
26	22,38	22,39	22,41	22,36
27	22,30	22,32	22,34	22,28
28	22,23	22:25	22,27	22,20
29	22,15	22,17	22:19	22,12
30	22, 6	22, 8	22:10	22, 3
31	21,57	21,59	22, 1	21,54

South Declination

The sixt Chapter shewing how to take the height of the Sunne with the crosse staffe, or with the Astrolabe, and also how to find the true Meridian, with other necessary matters.

TO take the true height of the Sunne at the sea, the best way is, to do it with the Crosse staffe, for that the sea is moueable, and causeth the ship to heaue & set little or much. And also vpon the crosse staffe the degrees be larger marked then the Ringe or Astrolabe: & in a large instrument, an error is some somer & better, than it is in a small instrument. How to take the height of the Sun, for to know ỳ Altitude of the Pole aboue the Horizon, do this: first set the sun with a compasse to know when he cometh neere vnto the Meridian: as sone as you see that the sun is come vnto the South and by East, then begin to take his height with the crosse staffe, in this manner. Put the Transuersary vpon the long staffe, then set the end of the long staffe close at the corner of your eye winking with your other eye & remouing the Trãsuersarie forward or backwards til you do see the lower end of it (being iust with the horizon) and the vpper end of it (being iust with the middle of the sun) both to agree with the sun & the Horizon at one time: and so haue you the true height of the sun. This done, still obserue the same, vntill you se the sun at highest, & begining to descend, the haue you finished.

How to obserue the Sun.

To take the height of the Sunne with the crosse staffe.

But note that if you obserue with the staffe in the top of the ship, and in the mid waist, and waist of the ship, you shall find great difference, so also betweene your obseruation on the top of a great billow, where the seas run whole and in the bottome betweene two great billowes, your best place to obserue is on the top of a great billow.

Yet notwithstanding this is to be noted: that it is best to take the height of the sun with the crosse staffe, when the sun is vnder fifty degrees in height aboue the Horizon, for two causes. The one is this: vntill you come to 50. degrees, the degrees be largely marked vpon the crosse staffe, but after 50 degrees they be lesser marked then the other are. Againe, the sunne being vnder 50. degrees in height, you may easily take

The cause why the crosse staffe is best to take the height of the Sunne vnder 50 degrees.

the height, because you may easily see or view to the vpper end and the neather ende of the Crosse staffe both at one time: but if it doth exceede 50. degrées, then by the meanes of casting your eye vpwards and downewards so much, you may soone commit errour, and then in like manner the degrées be so small marked, that if the sunne doth passe 50, or 60. degrées in height, you must leane the crosse staffe, and vse the Mariners Ring, called by them the Astrolaby.

To take the height of the Sunne with the Astrolaby.

How to correct your Astrolaby if it doth not hang vpright.

Now to take the height of the Sunne with the common Ring or Astrolabie, doe thus: The Sunne being (as before is declared) neere the Meridian or South, obserue it (vntill you haue the greatest height thereof) in this manner: Holde the Ring of the Astrolabie vpon one of your fingers, and turne the Alhidada vp and downe vntill you see the shadow of the Sunne pearce or passe through both the sights thereof, being sure that the Astrolabie doth hang vpright, which you may proue in this manner.

Looke at how many degrées and minuts the Alhidada doth stand vpon the Astrolabie, then turne the Alhidada vnto the same number of the degrées and minuts on the other side of the Astrolabie, and then taking the height of the sunne againe, if it doe agree as it did before, then the Astrolabie doth hang vpright: but if it doe not, then it doth not hang vpright. For knowledge of the true height of the sunne (the Astrolabie not hanging vpright) do thus: If the Astrolaby be truly marked, marke the diuersity, that being known, rebate from the greatest height half the diuersitie, or else adde vnto the lesser height halfe the diuersitie, & that shall be the true height of the Sunne, although that the Astrolabie doth not hang vpright.

The Astrolaby is best to take the height of the sunne at 60 or 80. degrees in height.

The Astrolabie is best to take the height of the Sunne, if the sunne be very high, at 90. 70. or 80. degrées, and the cause is this: The Sunne comming neere vnto your Zenith, hath great power of light, for to pearce the two sights of the Alhidada of the Astrolaby, and then it is not good to vse the crosse staffe, for that the sunne hurteth the eyes of a man, & besides that,

that it is too high to occupie the crosse staffe, (as before is declared) so that this way you may very much preserue your eyes. If you haue not glasses vpon your staffe (to saue your eies in taking the height of the Sun) but be vnprouided of them, do thus: take and couer the sunne with the end of the Trausuersary of the crosse staffe, vnto ỹ very vpper edge or brinke of the sunne, (so shal you not nede to behold ỹ brightnesse of it) and with the other end of the Trausuersary to take the Horizon truly, and that being done, because the Sunne is 30. or 31. minutes in Diameter or breadth, therefore you shall rebate 15. minutes from ỹ Altitude or height of the Sunne, and then that which shall remaine shall be the true height of the Sunne, from the centre or middle of the Sunne. And furthermore, theire is some errour in the taking the sunne or starre with the Ballastell or crosse staffe, and that groweth by thismeanes: for that the true Centre (which is the sight of the eye) is within the middle of the eye, and not in the outside of the eye, so that the end of the long staffe in the setting of it vnto the corner of your eye, doth stand somwhat further out then the sight of your eye, that is to say, that the sight of the eye is somwhat further into ỹ head, then the end of the staffe doth come vnto: wherefore you must pare away a little of the end of the staffe, for some mens eyes more, and some mens eyes lesse, for that it is according as you may set the staffe vnto the eye, for some men need pare away little or nothing, and some men must pare away 14 or 15. minutes as you may set the staffe, because some mens eyes be further into their head, then other some mens are, and the bones of some mens face stand further out then other some doe.

How to preserue your eyes whē you touch the Sun with the crosse staffe and haue no glasse.

The Diameter of the Sun is 30 or 31. minutes.

Some errour in the crosse staffe and how to reforme it.

It is moreouer conuenient to know the Meridian or south, which you must doe either with good Compasse, or with a perfect Diall or Needle: but if you be on the land, this you may do on a peece of timber or any other thing that standeth fast, with a payre of compasses make a circle, then in the middle or center where the fote of the cōpasse did stand,

To get the true Meridian vpon the Land.

set a wier vpright (as circumspectly as you can) and the you may doe this: loke in ỳ morning (so it be on plaine ground, that you may see the Horizon circle, without any lette at the Sunne rising, for the shadow of the wier) and there set a pricke: then at the setting of the Sunne you shall set another pricke, euen at the circumference of the circle, then diuide that with your compasses euen in two peces and strike a straight line from the wyre or center of the circle, to the middle or diuided pricke, and that shall be the true Meridian. Or else (the wyer standing vpright) first in the forenoone when the toppe of the wyer doth touch, or is readie to come into the circumference or edge of the circle, there make a pricke: then in the afternoone in like manner, where the shadowe of the wyer toucheth the edge of the Circle, there make an other pricke euen with the end out of the shadow: this done (as circũspectly as you can) diuide these two pricks in the middle, then as is before said, draw a line from ỳ center or wyer, to the middle pricke, and that shadow shall bee your true Meridian.

After an other manner you may do this: loke, and watch when the wyer giueth the shortest shadow, there make a pricke, then draw a line from that pricke to the wier, which shall be the true Meridian.

And yet furthermore, for that it is most conuenient to know the true Meridian at the sea, because in long viages going farre vnto the Westward or Eastward, the compasse doth varie: to find the true Meridian, do this; Set the sunne with your compasse at his rising or appearing aboue the Horizon, and then (knowing what point and part of the sunne doth rise at) set the Sunne with your compasse at the setting or departing vnder the Horizon, and (that being knowen) you shall perfectly know whether the compasse be varied, and how much, by the diuiding the pece of the circle contained betwene the rising and setting of the sun into two equall parts, for the right line drawn frõ the center of the circle through ỳ point or the partition expresseth ỳ true Meridian, and

To know the true *Meridian* at the Sea, and also if your cõpasse be varied, and to know how much they be varied.

and the proportion of the circle contained betweene the said line and ỳ South point of your compasse sheweth the quantity of the variation. For ensample this, I do set the Sunne at his rising with the compasse, and he doth rise vpõ ỳ East point: in like maner also I doe set the Sunne with the compasse at her setting, and doe finde her to set West Northwest: so I do see the compasse to be varied one point, that is to say the North point doth stand North and by East &c. And furthermore, (for that seldome times the Sunne doth rise and set cleere by the meanes of the clouds, & other impediments nere the Horizon) you may get the true Meridan thus: at any time in the forenoone, first set the Sun with your compasse, and then take the true height of the Sunne.

Then you (knowing how many degrees the Sunne was high at that point of the compasse) you may in like manner obserue the Sunne in the afternoone, untill you do finde the Sunne iust at that height that it was in the forenoone, marking at what point of the compasse the Sun is, and so shall ye see perfectly whether the compasse be varied ai. no, & also how much: for ensample thus, I take the Sunne vpon the Southeast point 20. degrees aboue the Horizon, and then in the afternoone, I doe obserue the Sunne vntill such time as as I doe find the sunne iust 20. degrees aboue the Horizon againe, and then I set the Sunne with the compasse, and doe finde the Sunne to be at 20. degrees in height Southsouthwest, so that I see the cõpasse to be varied one point, that is to say, the North point doth stand North and by East &c.

And another way also to know the true meridia by the sun is this: to set the Sunne with the compasse at her greatest height aboue the Horizon, and so you shall know whether ỳ compasse be varied, and how much: and take what is spoken of the sunne by day, you may doe the like, by night by any of ỳ stars that you perfectly do know, doing as you do by the sunne in all points: but you cannot do it so well and truely by the Moone, by the meanes of the swiftnes of her motion in the Zodiacke, you may also finde the variation by ỳ compasse

To find the variation of the compasse in the night by the stars, but not by the Moone.

compasse of the north starre, as thus set the north starre with the Compasse, if the north point doth stand right with the starre, the it is not varied: but if it doth not stand with the starre, then it is varied: and that must be done when the two starres of Charles waine called the pointers, be right under, or right ouer the north starre: but if the starres be West from the north starre, then the North starre is the third part of a point vnto the Eastward of the North Pole. If the two starres of Charles waine, called the Pointers, be due East from the North starre, then the North starre, is the third part of a point vnto the westward of the North Pole, &c.

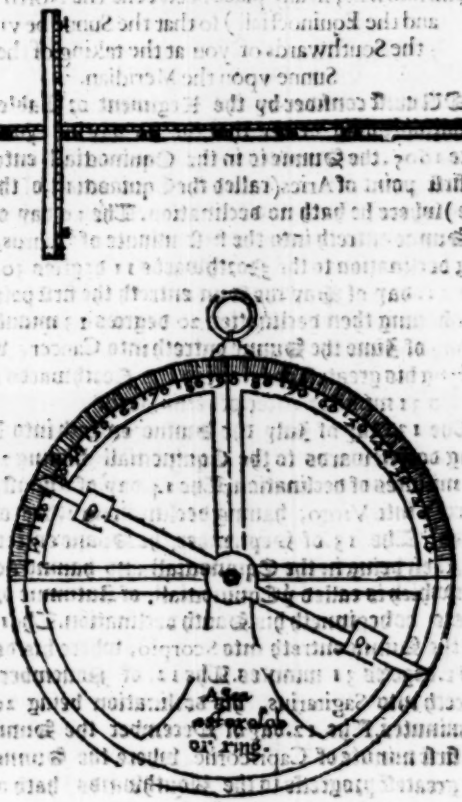
This haue I said, because that sometime in sundry places, the Compasse doth varie (the variation is called the North-falling or North-welling of the Compasse) especially in the sayling of long voyages, running East and west, therefore I would not with them to meddle with the mending of their Compasse, or whetting of the side of the Needle, to the end to make it stand due North, but circumspectly to wait the altering of the Compasse, and what quantity it doth alter: as you may do very well by the order before rehearsed, and then let your Compasse alone: for although it doth varie two or three points, you may make account according to the variation, as thus, I omit the Northwest point standeth due North, and my course is to go due West, I will occupie the southwest point in this case for the west point. And thus (by obseruation and trying of my Compasse) I care not what point standeth due North, for it is all one, so that you consider, what point standeth North. And also there is deuised by one Norman a Compasse-maker, a very necessarie deuice in a Compasse that you may set the North point vpon what degree you list, according vnto the true variation of the Compasse, at all times at your pleasure.

Meddle not with your Compasse al. though it be varied.

To saile by the Compasse that is varied.

The Bella Stella or Crosse-staffe,

To take the hight of the Sunne or Starre.



The vij. Chapter, Howeth how to handle the declination of the Sun, to know the Altitude of the North Pole aboue the Horizon, (the height of the Sun being timely taken and knowne, in any place betweene the North Pole and the Equinoctiall) so that the Sunne be vnto the Southwards of you at the taking of the Sunne vpon the Meridian.

YOV must consider by the Regiment or Table of declination (going before) that the 10 day of March in the yeere 1605. the Sunne is in the Equinoctiall, entring then the first point of Aries (called the Equinoctiall, or the spring-time) where he hath no declination. The 10 day of Aprill, the Sunne entreth into the first minute of Taurus, then hauing declination to the Northwards 11 degrees 30 minutes The 11. day of May the Sun entreth the first point of Gemini, hauing then declination 20 degrees 13 minutes. The 11 day of June the Sunne entreth into Cancer, where hee making his greatest progresse to the Northwards) hath 23. degrees 31 minutes 30 sec. of declination.

The greatest declination of the Sunne.

The 13. day of July the Sunne entreth into Leo, comming downewards to the Equinoctiall, hauing 20. degrees 13. minutes of declination. The 14. day of August, the Sun entreth into Virgo, hauing declination 11. degrees 31. minutes. The 13. of September, the Sunne entreth into Libra, then being in the Equinoctiall, and hauing no declination (which is called the Equinoctiall, of Autumne or harueſt. where he beginneth his South declination. The 13 of October the Sunne entreth into Scorpio, where his declination is 11. degrees 31 minutes. The 12. of November the Sun entreth into Sagitarius, his declination being 20. degrees 13 minutes. The 12. day of December the Sunne entreth the first minute of Capricorne, where the Sunne (making the greatest progresse to the Southwards) hath of declination 23. degrees and 31 ½. minutes. From whence he returneth to the Equinoctiall againe. The 10 of Januarie the Sunne entreth into Aquarius, where his declination is 20 degrees 13 minutes The ninth day of February the sunne

Equinoctiall of Autumne

entreth

entreth into the firſt minut of Piſces, and hath declination 11 degrees 31 minuts The 11 day of march, the ſunne returneth to the ſelfe ſame place that it departed from before: wherefore the Egyptians did paint the yeare like to an Adder biting her taile, not hauing the vſe of letters. And the Romans called a Ring, Annulus as it were Annus, that is to ſay, a yeare, becauſe a Ring doth turne round in it ſelfe, as doth the yeare, The meridian height of the Sunne being known, you knowing the day of the month, and what yeare it is after Biſſextilis, muſt turne to the day of the mounth, in the Regiment or Table going before, where right againſt the day of the mounth you ſhall finde the degrees of declination, and the odde minuts belonging to the degrees of the declination following: that being knowen) that is to ſay, the Meridian height of the Sun with the degrees and minuts of the declination) conſider with your ſelf whether the ſunne declineth from the Equinoctiall toward the Pole, which is aboue the Horizon, or toward that Pole, which is vnder the Horizon. If the Sunne declineth from the Equinoctiall toward that Pole which is aboue the Horizon, you muſt alwaies ſubduct the declination frō the Meridian Altitude of the Sunne, the remainder is the height of the Equinoctiall The height of the Equinoctiall being ſubducted from 90. yeeldeth the hight of the Pole aboue the Horizon But if that the ſunne declineth toward that Pole which is vnder the horizon, you ſhall adde or put that declination vnto the height of the ſunne, the totall ſumme ſhall ſhew vnto you the true height of the Equinoctiall, the which ſumme being taken from 90. that which doth remaine, ſhall bee the Altitude of the Pole aboue the Horizon. For this is to be noted: that what height the Equinoctial is aboue the Horizon, ſuch is the diſtance betweene the Zenith or verticall point, and the Pole. In like manner, looke how many degrees and minutes are betweene the Equinoctiall and your Zenith, ſo many degrees and minutes are from the Pole downe to the Horizon, & this is the cauſe why you muſt take the height of the

The yeere is compared vnto a Ring or Adder biting her taile.

The height the Sunne being taken and knowne, then how to handle the declination, to know the height of the pole.

Things to bee noted as touching the taking of the Altitude of the pole.

the Equinoctiall, out of 90 degrées. For your Zenith being alwaies 90. degrées from the Horizon (as you see by this figure following) the height of the Equinoctiall being taken out of that number, leaueth the distance betweene the Zenith, and the Equinoctiall, which is equall to the height of the Pole aboue the Horizon.

The viii. Chapter sheweth you how to handle the declination of the Sunne: when you are betweene the Equinoctiall and the Sunne: that is to say, the Sunne being to the Southwards or Northwards of you, betweene the Sunne and the Equinoctiall, or vnder the Equinoctiall: the height of the Sunne being truly knowne or taken.

NOW furthermore if you bee vnto the South parts neere vnto the Equinoctiall, so that the Sunne haue any great declination eyther to the Southwards, or to the Northwards, you being betweene the Equinoctiall and the Sunne, when you haue taken the true height of the Sunne, with the Astrolobie to know the height of any of the two Poles, do this: take the declination of the Sunne for that day in degrées and minuts; the declination being knowne and the height of the Sunne in like manner, then add the declination of the Sun vnto the height thereof, and it will exceed or bee more than

90.

90 degrées: then againe loke how many degrées it is more than 90 that shall be the true height of the Pole towards that side that the Sunne is: because the Equinoctiall is the number of degrées aboue 90 (which is your Zenith) to the contrary part from the Sunne ward. For) as I haue said in the Chapter going before, and it is generall for euer) what height soeuer the Equinoctiall is from the Horizon, that is the true distance betweene the Zenith and the Pole: In like manner, loke what distance is betweene the Equinoctiall and Zenith, the same is the true distance betweene the Horizon and the Pole, that is to say, the Pole, is so many degrées in Altitude aboue the Horizon And where as it is a common saying (in searching how farre wee be vnto the Southwards or Northwards) that the Pole Artick is so many degrées in Altitude, or (as some will say) that we are so many degrées in Latitude: that saying is all one in effect although the one be called Altitude or height and the other, Latitude or wideneſſe: for as when you say Altitude or height of the Pole, you mean the Pole is raised so many degrées aboue the Horizon: so likewise when you say Latitude, you meane you be so many degrées in wideneſſe from the Equinoctiall, for that your Zenith or verticall point is so many degrées from the Equinoctiall, as the Altitude is found to bee. Moreouer, if you chaunce to bee right vnder the Equinoctiall, as you cannot say that you haue any Latitude, so like wise cannot you say that you haue any Altitude, for that the two Poles be then iuſt with your Horizon, and in like manner the Equinoctiall palleth by your Zenith or verticall point. But when you will take the height of the Sunne with your Aſtrolobie, then loke what declination the Sunne hath, eyther to the Southwards or Northwards. Then put the declination of the Sunne vnto the height of the ſame, and the number will be iuſt 90. degrées: if it lacketh any thing of 90 degrées, then it ſignifieth that the Equinoctial lacketh so much of the Zenith, and so much iuſt ſhall the Pole be aboue the Horizon

Altitude or Latitude is all one queſtiõ in effect.

Being vnder the Equinoctiall, you haue neyther Latitude nor Altitude, for that the Equinoctiall is your Zenith. & the Pole your Horizon.

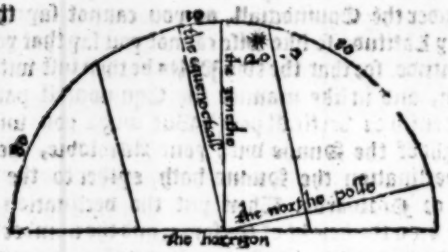
towards

towards that part that you be in from the Sunnwards. But contrariwiſe if it doth exceed, or be any thing more than 90. degrees, then (as afore is declared) it ſignifieth that the Equinoctiall is as much as that exceſſe (both in degrees and minutes.) On the contrary ſide from the Sunnwards; that is to ſay, your Zenith ſhall be betweene the Sunne and the Equinoctiall, and the Pole ſhall be ſo many degrees or minutes aboue the Horizon, as is the diſtance betweene the Zenith and the Equinoctiall, towards that part or ſide that the Sunne is on. Wherefore I do thinke it neceſſary to giue certaine examples (and firſt take this for an enſample.) Admit I doe take the height of the Sun vnto the Northwards 80. degrees aboue the Horizon, and the Sunne hath declination vnto the Northwards 20. degrees, to which I adde or put the height, that is to ſay 80. degrees, being the height of the Sunne, and 20 degrees, being the declination of the Sun, doe make 100. from which I pull 90. away, which is my Zenith, and ſo there remaineth 10. degrees. Where of we you may conclude, that the Equinoctiall is 10. degrees to the South part of the Zenith, and the Sunne to be 10. degrees to the North part of your Zenith, ſo that the North Pole is 10. degrees aboue the Horizon, as by enſample it is declared.

Of your Zenith being betweene Equinoctiall & the Sunnes.

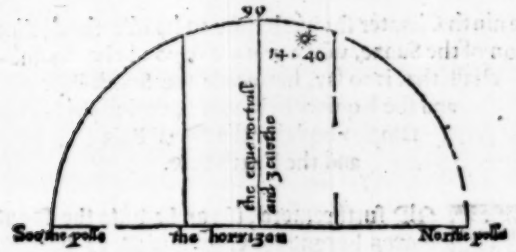
An enſample.

An enſample where the Pole is 10. degrees aboue the Horizon.



And

And for the second ensample, admit I take the Sun vnto the Northwards 75. degrées, and 20. minutes aboue the Horizon, the sunne hauing North declination 14. degrées forty minutes, I then doe adde or put 14. degrées, forty minutes, vnto 75 degrées 20. minutes, and those two ioyned together maketh 90. degrées, whereof you may conclude, that the Equinoctiall is your Zenith, and then the two Poles lie in the plane of your Horizon, as by this example it doth appeare.



And now followeth the third ensample. I admit the Sunne be taken with the Astrolabe 81. degrées and 15 minutes aboue the Horizon, and the sunne hath south declination 22. degrées 35. minutes, wherefore I doe adde or put together 81. degrées and 15. minutes, being the height of the sunne, and 22. degrées 35. minutes being the declination, & that maketh 103. degrées, 50. minutes, from which I take away 90. degrées, which is my Zenith, so that there remaineth 13. degrées, 50. minutes: so that you may safely conclude, that the Equinoctiall is 13. degrées 50. minutes, vnto the North parts of the Zenith, and then it must néeds fol-

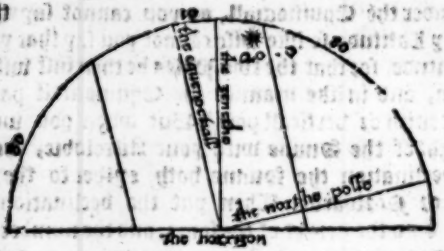
An ensample.

towards that part that you be in from the Sunnwards. But contrariwise if it doth exceed, or be any thing more than 90. degrees, then (as afore is declared) it signifieth that the Equinoctiall is as much as that excesse (both in degrees and minutes.) On the contrary side from the Sunnwards; that is to say, your Zenith shall be betweene the Sunne and the Equinoctiall, and the Pole shall be so many degrees or minutes aboue the Horizon, as is the distance betweene the Zenith and the Equinoctiall, towards that part or side that the Sunne is on. Wherefore I do thinke it necessary to give certaine examples (and first take this for an ensample.) Admit I doe take the height of the Sun vnto the Northwards 80. degrees aboue the Horizon, and the Sunne hath declination vnto the Northwards 20. degrees, to which I adde or put the height, that is to say 80. degrees, being the height of the Sunne, and 20 degrees, being the declination of the Sun, doe make 100. from which I pull 90. away, which is my Zenith, and so there remaineth 10. degrees. Where of you may conclude, that the Equinoctiall is 10. degrees to the South part of the Zenith, and the Sunne to be 10. degrees to the North part of your Zenith, so that the North Pole is 10. degrees aboue the Horizon, as by ensample it is declared.

Of your Zenith being betweene Equinoctiall & the Sunnes.

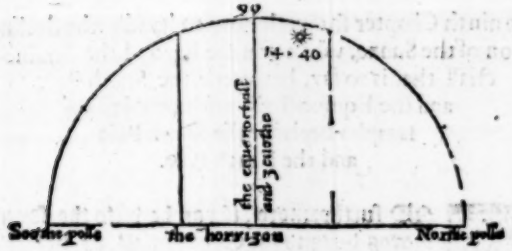
An ensample.

An ensample where the Pole is 10. degrees aboue the Horizon.



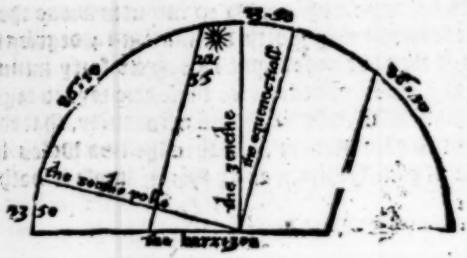
And

And for the ſecond enſample, admit I take the Sun vnto the Northwards 75. degrées, and 20. minutes aboue the Horizon, the ſunne hauing North declination 14. degrées forty minutes, I then doe adde or put 14. degrées, forty minutes, vnto 75 degrées 20. minutes, and thoſe two ioyned together maketh 90. degrées, whereof you may concinde, that the Equinoctiall is your Zenith, and then the two Poles lie in the plane of your Horizon, as by this example it doth appeare.



And now followeth the third enſample. I admit the Sunne be taken with the Aſtrolaby 81. degrées and 15 minutes aboue the Horizon, and the ſunne hath ſouth declination 22. degrées 35. minutes, wherefore I doe adde or put together 81. degrées and 15. minutes, being the height of the ſunne, and 22. degrées 35. minutes being the declination, & that maketh 103. degrées, 50. minutes, from which I take away 90. degrées, which is my Zenith, ſo that there remaineth 13. degrées, 50. minutes: ſo that you may ſafely conclude, that the Equinoctiall is 13. degrées 50. minutes, vnto the North parts of the Zenith, and then it muſt néeds follow An enſample.

low, that the south Pole is 13. degrées, 50. minutes abeue the Horizon, as by this ensample it is declared.



The ninth Chapter sheweth how to handle the declination of the Sunne, when you are beyond the Equinoctiall, that is to say, betweene the South Pole and the Equinoctiall: with certaine ensamples both for the South Pole and the North Pole.

AND furthermore, if you be vnto the Southwards beyond the Equinoctiall, as betweene the Tropicke of Capricorne and the South Pole, then to vse the declination of the Sunne to know the height of the South Pole or Antarticke Pole, by the height of the Sunne, there is no other matter in the doing thereof, but whereas wee (beeing vnto the North parts) doe adde the South declination vnto the height of the Sunne, and rebate the North declination from the height of the Sunne so in like manner the contrary is to bee vsed, that is to say, to rebate the South declination from the height of the Sunne, and to adde vnto the height of the Sun the North declination. As for example, I admit the height of the Sunne be taken 28. degrées aboue the horizon due North, and

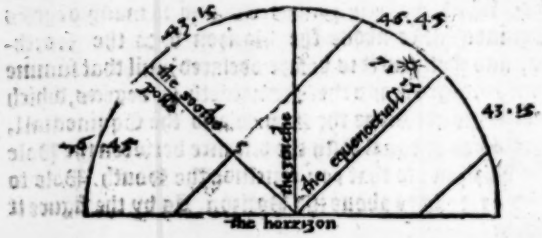
To take the Sunne to the Northward, you being betweene the South pole & the Equinoctiall.

and the declination of the Sunne is 21. degrées vnto the Northwards, I doe then adde the declination of the Sunne which is 21. degrées, vnto the height of the Sun (being 28. degrées,) which maketh 49. degrées, and so many degrées the Equinoctiall is aboue the Horizon vnto the Northwards, and then (as it is before declared) pull that summe out from 90. degrées, and there remaineth 41. degrées, which is the distance betweene the Zenith and the Equinoctiall, which alwaies is equal with the distance between the Pole and the Horizon: so that you conclude the South Pole to be raised 41. degrées aboue the Horizon. As by the figure it is shewed.

An ensample by taking the south pole 41. degrees aboue the Horizon.

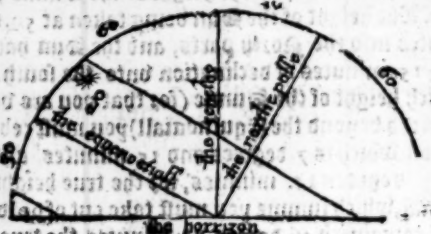
And furthermore if the Sunne hath South declination, then (as before is declared) you must subtract or take away the Suns declination from the height of the Sunne, as for ensample. The height of the Sun being taken at 50. degrées 30. minutes into the North parts, and the Sun hauing 7. degrees & 15. minutes of declination vnto the southwards, from which height of the Sunne (for that you are vnto the Southwards beyond the Equinoctiall) you must rebate the declination, which is 7. degrees and 15. minutes. and there resteth 43. degrees 15. minutes, for the true height of the Equinoctial, which summe you must take out of 90. degrees that done, remaineth 46. degrees, 45. minutes, the true height of the South Pole aboue the Horizon, otherwise called the

Antartick Pole, as by enſample of this figure is plainely ſhewed



An enſample by taking the North Pole 60. degrees above the Horizon.

yet furthermore I do think it conuenient to giue you an enſample vnto the Northwards, that you may perfectly know the true order of the working, both for the North part, and alſo the South part. Admit therefore I take the height of the Sunne due South, at 50. degrées aboue the Horizon, the ſunne hauing then North declination 20. degrées: Now (for as much as you haue the North Pole aboue the Horizon) you muſt rebate the ſuns declination from the height: ſo that 20. degrées being taken away from 50. there reſteth 30. which is the height of the Equinoctiall aboue the Horizon, and that 30. being taken from 90. there reſteth 60, ſo that you may boldly affirme the North Pole to be 60 degrées aboue the Horizon, as by this figure following is ſhewed.



In

In like manner the sunne being taken at that height and due South, having the like declination also to southwards that it had before to Northwards; that is to say, being 50 degrees in height, & having 20. degrees of declination unto the south parts, you must adde or put the declination of the sun unto the height of the same, and it maketh 70. degrees, which is the height of the Equinoctiall aboue the Horizon: this done, that 70. being taken out of 90. there remaineth but 20. so that the North Pole is but 20. degrees aboue the Horizon, as by the ensample of this figure is shewed.

For by the declination and height of the Sun, the true height of any of the Poles is knowne. Alwaies having this consideration, that if the North Pole be aboue the Horizon, the south declination must be added, or put to the height of the Sunne, but the North declination of the Sun must be subducted from his height; contrariwise, if the south Pole be aboue the Horizon, you must adde the North declination vnto the height of the Sun, & take away the South declination from the height of the same. Now to know which of the two Poles be aboue the Horizon is a very easy matter, and is known two waies, for first if the North Pole be aboue the Horizon, you may know it by all the Stars round about the Pole, as Charles Waine, and the Guards, with such other starres as be about the North Pole. Neither can you passe so sodainly beyond the Equinoctial, but it must needs be known

A thing to bee noted in the handling of the sunnes declination.

How to know which of the 2. Poles be vnder the Horizon.

vnto you, and then muſt vſe that kind of working with the ſuns declination that in the chapter or rule before is reheatſed: and alſo you may know it by the Arke or bearing of the ſtarres & lights round about you: for if you turne your face toward the Equator, you ſhall ſee the ſtars aſcend from your left hand toward your right, if you be on the Northſide of the world: But if you be on the Southſide, and turne your face towards the Equinoctiall, you ſhall ſee them riſe from the right towards the left hand. Thus much haue I ſaid as touching the Sunnes declination, becauſe I know that diuers Engliſhmen would haue traueled further beyond the Equinoctiall then they haue done, but that they haue not had the capacity to handle the Sunnes declination when they haue ben beyond the Equinoctiall, that is to ſay, vnto the ſouth parts, hauing loſt the markes aboue the North Pole, as the North ſtarre and other; and as for the ſtarres of the South, they haue not ben acquainted with them, but haue beaten vp and downe alongſt the coaſt of Ginny and Binney, and there haue ſpoyled and conſumed their men through the extraordinary heat of the Sunne, not knowing that in going further to the ſouth parts, they ſhould haue brought themſelues into a good temperate Climate againe.

The cauſe why Engliſh men haue not trauelled farre beyond the Equinoctiall.

An vntemperate place for extreame heat.

Temperate Climate.

The tenth Chapter ſheweth, how to handle the Sunnes declination vnto the Northwards, where the Sunne doth not ſet vnder the Horizon; and alſo to take the Sun at the loweſt being due North.

FOR further vſe of the Sunnes declination, if you haue any occaſion to trauell vnto the Northwards or Southwards more than 67. degrees of altitude of any of the two poles, or if the Sun haue any great declination vnto thoſe parts that you are in, then ſhall not the Sun go downe vnder the Horizon in a long time after, according as you are in diſtance more or leſſe vnto the North parts, for if you were right vnder eyther of the 2. Poles of ỹ world, then would

Of being vnder either of the poles.

would not the Sunne go vnder the Horizon in halfe a yeer, so that there should be continually day so long. And now for the handling of the Sunnes declination, to know the height of the pole, and to take the Sunne North at the lowest, doe this: First with your crosse staf, obserue the Sunne at the lowest, taking the true distance between the Horizon & the Sunne; that being truly done, loke what declination the Sunne hath: then haue you to consider that except the Sun be neere vnto his greatest declinatiõ, that is to say, in the latter end of Gemini, (or the beginning of Cancer,) the Sunne doth decline little in 24. houres: but if the declination be very swift, you must take the Sunnes declination vpon the day before, & the day after, halfe the diuersity of which shall be the Sunnes declination: for that the Sun is at the angle of midnight. The Sunnes true declination being knowne, rebate his height from the declination, and so shall you haue the true content in degrees and minutes, that the Equinoctiall is vnder the Horizon due North; and then pulling that summe from 90. that which remaineth shall be the height of the pole aboue the Horizon: for as it is before declared loke what height the Equinoctiall is aboue the Horizon, that is equal to the distance betwixt the Pole and the Zenith; and loke what distance is betwixt the Equinoctiall and the Zenith, the same distance is betwixt the Pole & the Horizon; in like manner, loke how deepe vnder the Horizon the Equinoctiall is vnto the Northwards, so high is the Equinoctiall vnto the Southwards. As for example, admit I were vnto the Northwards of the North cape, the Sunne being in his greatest declinatiõ vnto the Northwards, which is about the 11. day of June 23. degrees & a halfe: this being knowne, I take the Sunne due North at the lowest, iust fiue degrees aboue the Horizon, the declination being 23. degrees and 28 minutes. Wherefore I rebate from that, fiue degrees, and so there remaineth 17. degrees & 28 minutes, which expresseth the depth of the Equinoctiall vnder the Horizon, & then do I pul that sum from 90, & there remaineth 72 degrees, 32 minutes

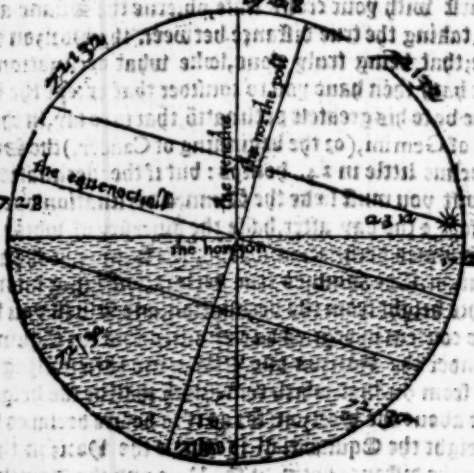
Of taking the height of the Sun due north at the lowest.

A thing worthy to be noted touching the Sunnes declination.

A thing to bee noted of the pole and the Equinoctiall, the Zenith, & the Horizon.

The Sunne taken due North at 6 degrees.

nutes, for the true height of the North pole aboue the Horizon, as by this example following is declared.



By this example you may also knowe the true height of any of the two Poles, & how to obserue the Sun at the lowest, when the Sunne commeth nereſt vnto the Horizon, as well as you may when the Sunne is in the meridian at the greateſt height from the Horizon, which is very neceſſary for them that doe occupie vnto the Northwards, as vnto Saint Nicholas in Ruſſia, it is also very neceſſary for them that would attempt any voyages of diſcouery to finde out the paſſages to come vnto Catai and China, and the Ilands of Moluccas, vnto the Northwards, as into the Eaſt by Noua Zemla, or to the weſt, by that way that Captaine Frobiſher hath begun to the northwards of Baccalaois, and Labrandor, For it is to be ſuppoſed, that amongſt thoſe broken lands

Of voyages for diſcouery to the Northwards either to the eaſtward, by Noua Zemla or to

lands and Islands, that there may be found passage vpon the north part of America, but the great quantitie of Ice may somewhat hinder the prosperitie of that discouery, and yet notwithstanding my opinion is, that it is not frozen there so much to haue such huge quantitie of Ice, but that it may be frozen more farther vnto the North parts, and so by some current or streame brought thither, and so is stayed vpon the coast of Labrador & Baccalaios, by the meanes of the great current that cōmeth out of the Bay of Mexico all alongst the North side from Florida vnto Bacalaios, or new found land.

the Westward by Cape de paramantia.

Additions.

And yet notwithstanding, it may be possible that if that they did discouer more vnto the northwards, that they shold not meete with so much Ice. For at the north cape in Norway, which is much more vnto the Northwards, there is seldome seene any great quantitie of Ice, and yet some ships laue bone beaten off vnto the north of the cape neere 200. leagues, so that they then neere 80. degrees of the height of the North Pole aboue the Horizon, and yet they haue not met with Ice, and it is farther vnto the North parts by 17. degrées, then that place that Frobisher was at.

Wherefore if it were attempted, there is no doubte but they would finde it Nauigable either to the East part, or to the West part: and I am of this opinion, that the thing most feared in making their discouery vnto the Northward deserueth not so much to be feared as they doe make it: the cause why they are so loth to goe very farre vpon the northwards, is, for that it is the frozen Zone; but my opinion is that in summer time it is not to be feared, but the further vnto the northwards, the more temperate warme by meanes of the long continuance of the Sunne: for as we see by common experience a thing being once made warme, cannot so dainly be made cold, neither is there doubt of any great cold vntill the Sunne be vnto the Southwards of the Equinoctiall: for I admit that a ship should sails vnto the northward, and not stay vntill the nort Pole were eleuated 80 degrees aboue the Horizon, I do thinke that they should find it very

Of temperatenesse, the pole being raised 80. degrees.

temperate

temperate and warme, vnto the middle of September, for that by the ſpace of nine weekes together, that is to ſay, from the 20. of May, vnto the 12. of July, the Sunne ſhould come no nerer vnto the Horizon one North then 10. degrees, and 30. degrees vnto the South part above the Horizon: and yet it is poſſible that it may be cold there vntill the end of May, for that the Sunne muſt haue a time to make the aire warme. For like as a thing once being cold, cannot be ſodenly made warme, ſo in like manner a place being once made warme, cannot be ſodenly made colde.

And furthermore, he that were in the Latitude of 80. degrees, ſhould haue but a ſhort Parallel: for the whole Compaſſe of the earth and the ſea going eaſt and weſt, to come round about to that place againe in the ſame Parallel, is but 1250. Engliſh leagues, euery league containing three Engliſh miles: ſo that in ſailing of leſſe then 500. or 600. leagues, they might ſee whether it were nauigable or not. For this is one principle, that if that they doe not meet with land, then they ſhall find ſea, to accompliſh the long deſired paſſage to find out Cattais.

The length of the parallell. 80 degrees is but 1250 Engliſh leagues.

The xi. Chapter doth ſhew how you ſhall know the length of the day, and to know how much the day is ſhortned or lengthned by the Sunnes declination.

NOW I thinke it conuenient for ſea-faring men to know the length of the day in any place that they haue occaſion to goe vnto: for that they haue occaſion to trauel into all the climates and places, tranſporting themſelues many times quickly from one place to another: & although the ancient writers haue appointed certaine climates, and other late writers in like maner haue made tables very exact for the longeſt or ſhorteſt day in any of thoſe climates and

and other plates, according to the elevation of the Pole: yet haue they not opened any way vnto them, in giuing any order for them to know when the day is an houre longer or shorter, whereby they might at all times know the length of the day; which notwithstanding is very necessary for them, for that they be abroad vnder saile both night & day, and in like manner for that they must keepe an account of houres and times exactly, in as much as they ought to keepe an account of the shippes way: wherefore it must needs be most necessary for Nauigation, to know the true time of the Sunnes rising and setting, which you shall know by this meanes: First, it is not vnknowne, that vnder the Equinoctiall the Sunne is 12 houres aboue the Horizon, and 12. houres vnder the Horizon, (what declination soeuer the Sunne hath) so that there the Sun riseth at six of the clocke, and setteth at six of the clocke for euer.

How necessary it is for a Seafaring man to know the length of the day.

Vnder the Equinoctial, the day is alwayes 12 hours long.

And where the Pole is raised 16. degrees and 44. minutes, there the longest day is 13. houres, (the Sunne hauing declination 23 degrees, 28. minutes) and the shortest day is 11. houres long, and then is when the Sun hath declined 23. degrees and a halfe either backwards or forwards, for then the day is an houre longer or shorter, and proportionably: when the Sunne hath declined 11. degrees, 44. minutes, then it is halfe an houre longer or shorter, &c. Moreouer where the Pole is elevated 30. degrees, 48. minutes, there the longest day is 14. houres, and 4 minutes, the shortest day is 9 houres long 56 minutes, the Sun then rising at fiue of the clocke, and setting at seauen of the clock almost, and there when the Sunne hath declined 12. degrees and 44 minutes from the Equinoctiall, vnto the greatest declination, then the day is an houre longer or shorter, and when the Sunne hath declined fiue degrees 52. minutes, then the day is halfe an houre longer or shorter, &c. Furthermore also where the Pole is raised forty one degrees 23 minutes, there the longest day is 15 houres, and the shortest, nine houres long, (the Sunne hauing

The Pole 16 degrees 44 minutes, the day 13 hours long, when it is at the longest.

The pole 30 degrees 48 minutes, the longest day 14 houres long.

The pole 41 degrees 23 minutes, the longest day 15 houres long.

his

his greatest declination, and he then rising at foure of the clocke 30. minutes, and setting at seaven of the clocke 30. minutes, so that there when the Sunne hath declined seuen degrees 49. minutes from the Equinoctiall the day shall be an houre longer or shorter, and where it hath declined three degrees 54. minutes, the day shall be halfe an houre longer or shorter, &c. And furthermore, where the Pole is raised 49. degrees one minute, there the longest day is 16. houres, and the shortest eight houres long, the Sunne rising at foure of the clocke, and setting at eight of the clocke: so that where when the Sunne hath declined fiue degrees, 45. minutes from the Equinoctiall, then shall the day be an houre longer or shorter. And when the Sunne hath declined two degrees 30. minutes, then the day shall be halfe an houre longer or shorter, &c. Yet furthermore, where the Pole is raised 54. degrees 30. minutes, there the longest day is 17. houres and the shortest seuen houres long, the Sunne then rising at three of the clocke 30. minutes, and setting at 8. 30. minutes then when the Sunne hath declined fiue degrees and 45. minutes from the Equinoctiall, to the greatest declination, the day is an houre longer or shorter, and when he hath declined two degrees 21. minutes, the day is halfe an houre longer or shorter, &c. Where also the Pole is raised 58. degrees 27. minutes, there the longest day is 18. houres long, and the shortest but fiue, and then when the Sunne hath declined three degrees 45. minutes from the Equinoctiall the day shall be an houre longer or shorter: and when the Sunne hath declined two degrees lacking two minutes, then the day shall be halfe an houre longer or shorter. Furthermore also where the Pole is raised 61. degrees, 18. minutes, there the longest day is 19. houres long, and the shortest but fiue houres: then shall the Sunne rise at two of the clocke 30. minutes, and set at 9. 30. minutes, and then when the Sunne hath declined three degrees, and 12. minutes from the Equinoctiall, then shall the day be an houre longer or shorter, &c. Furthermore, where the Pole is raised 63. degrees 12. minutes

The pole raised 49. degrees one minute, then the longest day is 16. houres long.

The pole raised 54 degrees 30. minutes, then the longest day is 17. houres long.

The pole raised 58. degrees, 27. minuts, the longest day is 18. houres long.

The Pole raised 61 degrees, 18 minutes, the longest day is 19 houres long

nutes

nutes there the longeſt day is 20. houres long, and the ſhorteſt but foure houres, then ſhall the Sunne riſe at two of the clocke and ſet at 10. of the clock, and when the Sunne hath declined 2. degrées and 56 minutes from the Equinoctiall vnto the greateſt declination, then ſhall the day be an houre longer or ſhorter, &c.

The Pole 63. degrees one minute, the longeſt day 20 houres long.

Now where the Pole is raiſed 64. degrées 49. minutes there the longeſt day ſhall be 21. houres long, & the ſhorteſt but three houres: and then when the Sunne hath declined but two degrées 36. minutes from the Equinoctiall vnto the greateſt declination, the day ſhall be an houre longer or ſhorter. Where alſo the Pole is raiſed 65. degrées, there the longeſt day ſhall be 22. houres, and the ſhorteſt but two houres long, and when that the Sunne hath declined but two degrées and 20. minutes from the Equinoctiall, then the day ſhall be an houre longer or ſhorter. And where the Pole is raiſed 66. degrées 20. minutes, the longeſt day ſhall bee 23. houres long, and the ſhorteſt but one houre long; and then when that the Sunne hath declined but two degrées eight minutes. the day ſhall be an houre longer or ſhorter, and where that the North Pole is raiſed 66. degrées and 32. minutes there it is 24. houres long, for that when the Sunne hath his greateſt declination vnto the Northwards, then at midnight, you ſhall ſée halfe the Sunn, and when that the Sunne hath the greateſt declination vnto the South parts, then you ſhall ſée but halfe the Sunne at noone, and in going but 15. miles further vnto the Northwards, that is, but one quarter of a degrée, then the Sun ſhall bee cleane aboue the Horizon at the due North, & not ſéene at noone aboue the Horizon, the Sunnes having his greateſt declination to the South, and then the day ſhall be an houre longer or ſhorter when that the Sunne hath declined one degrée 57. minutes from the Equinoctiall, and ſo forth vnto the greateſt declination. And thus much haue I ſaid as touching the length of the day, whereby you may know at all times the true length of the day in any Latitude betwéene the Equinoctiall & the

The Pole raiſed 64. degrees 49 minutes, the longeſt day 21 houres long

The pole 65 degrees the longeſt day 22 houres long.

The pole 66. degrees 20. minutes, the longeſt day 23. houres long.

The Pole 66. degrees 32. minutes, then the Sunne ſhal not ſet vnto them.

The Sunne cleane aboue the Horizon due North, & not to appeare aboue the Horizon, South at noone.

eleuation

To konw the length of the day at any time, in any place: what the day is.

elevation of the Pole at 66. degrees and 32. minutes, by knowing how many degrees the Sun is declined. And that you may know on euery day by the regiment going before, having this cõsideration, if the Sun be in the Equinoctiall, having no declination then in any Latitude the day is alwaies iuſt 12. houres long. And you muſt note this, that it is called the day from the riſing of the Sun, vnto the ſetting of the ſame vnder the Horizon, and not from day light vnto day light. For before the Sun riſe, and after that the Sunne is ſet, it is counted for no parcell of the day, but it is called the day light. And furthermore, the day light will appeare by that time that the Sun doth touch the 17. degree vnder the Horizon before the Sunne riſing. and alſo the day light will not be cleane gone vntill the Sun be more then 17. degrees vnder the Horizon: as you may perceaue heere with vs at London, that when the Sun hath his greateſt declination vnto the Northwards in Iune, the day light remaineth all night, for that the Sunn goeth not vnder the Horizon, but 15. degrees.

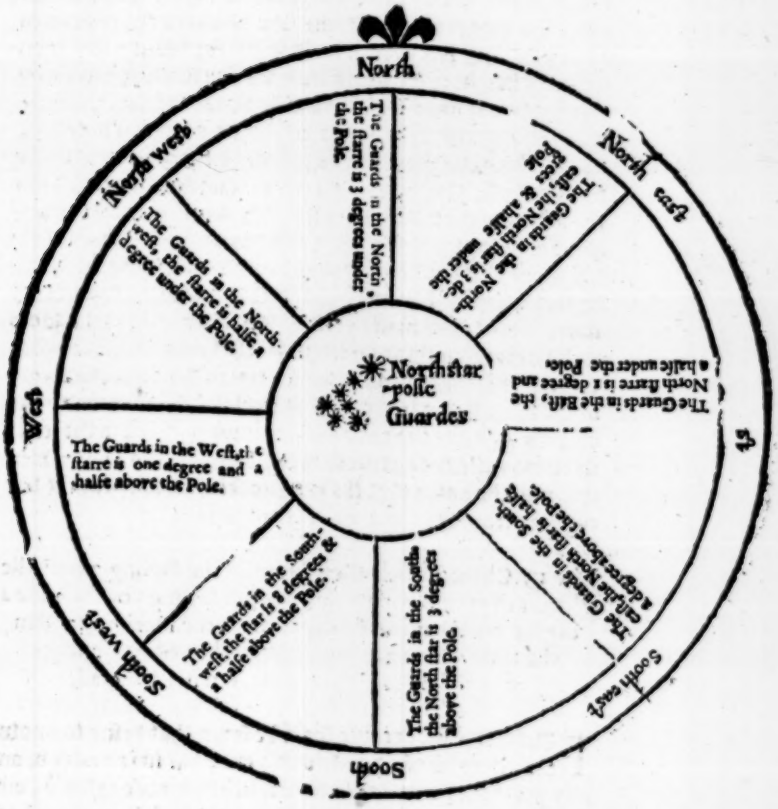
The xii. Chapter is of the North Starr.

So touching the North ſtar, I ſay but little thereof, for that is ſufficiently declared in the Art of Nauigation, the ſtarre hath Longitude vnto the 23. degree, 30 minutes of the ſigne of Gemini, and commeth to the Meridian with 3. degrées 45. minutes of Aries. This ſtarre ſtandeth vppon the tippe of the taile of Vrſa minor, or the litle Beare, & hath Latitude from the line Eclipticke 66. degrées, 2. minutes, and declination frõ the Equinoctiall 87. degrées, 20. minutes, ſo that it is diſtant from the Pole two degrées & 40. minutes.

The North Starres declination.

Heere followeth the note by the Guards, to knowe whether the North ſtare be aboue the Pole, or vnder the Pole, and how many degrées and minutes, &c.

By


North
North west
North east
West
East
South west
South east
South
Northstar
polle
Guardes
The Guards in the North, the ſtarre is 3 degrees under the Pole.
The Guards in the North-eaſt, the North ſtar is 3 degrees & a halfe under the Pole
The Guards in the Baſt, the North ſtarre is 1 degree and a halfe under the Pole.
The Guards in the South-eaſt, the North ſtar is halfe a degree above the Pole.
The Guards in the South the North ſtar is 3 degrees above the Pole.
The Guards in the South-weſt, the ſtar is 8 degrees & a halfe above the Pole.
The Guards in the Weſt, the ſtarre is one degree and a halfe above the Pole.
The Guards in the North-weſt, the ſtarre is halfe a degree under the Pole.

By obſerning of that, which is ſet downe in the former figure we may readily finde the height of the Pole, the height of the Northſtarre being alſo knowne. For if in taking the height of the Northſtarre, we finde the guards to beare from it Weſt South weſt, South or South-eaſt, then from the height of the ſtarre we muſt ſubduct ſo much as by this figure we finde the ſtarre to be aboue the Pole, the remainder erpreſſeth the height of the Pole. But if in taking the height of the Northſtarre we finde the guards to beare from it Eaſt, Northeaſt, North or Northweſt, then vnto the height of the ſtarre, we muſt adde ſo much, as by the former figure we finde the ſtarre to be beneath the Pole, the totall ſumme erpreſſeth the height of the Pole. Furthermore by two ſeuerall Altitudes of the North-ſtarre or any other ſtarre which doth neuer ariſe or ſet, the height of the Pole may be found in this manner: take the height of the ſaid ſtar when it is at the higheſt in the Meridian, take alſo the height of the ſame ſtarre when it is at the loweſt, adde both the heights together, the halfe of that number added to the leſſer Meridian Altitude, erpreſſeth the height of the Pole: But this muſt be noted that the heights ſeuerall taken, muſt bee counted from the ſame ſide of the Horizon.

The 13. Chapter doth ſhew you by the ſayling vpon the quarter of your compaſſe, in how farr ſayling you doe raiſe a degree, and what you do depart from the Meridian, and in the end there is a demonſtration thereof: reckoning it as yon do ſaile vpon a flat, but not Spherall.

Furthermore, becauſe there be ſome that deſire to know the alteratiõ of a point, to this end, that in running vpon any point, they may know how much they raiſe or lay ỳ pole ſoner vpon one point then vpon an other, I haue therefore thought good to ſet the matter downe briefely in this Chapter: in going to the North, you doe ariſe the Pole, and lay the Equinoctiall: contrariwiſe, going towards the South, you

In going South wards you raiſe the Equinoctial, and lay the Pole.

you lay the Pole, and raiſe the Equinoctiall. But in ſailing or going Eaſt or weſt, you doe neither alter your Pole nor Parallel: but onely your Meridian. Whereas in ſailing vpon any other point ſauing South and North, you do alter both your Pole and Parallel, and alſo your Meridian. Wherefore I wil open vnto you (in ſailing vpon one of the quarters of the Compaſſe) what diſtance vpon euery point doth raiſe or lay one degree, and how many miles you are diſtant from the Meridian of that place from whence you departed. But here is one thing to be noted (as I ſuppoſe) in the moſt part of Cards they allow for euery degree but 17. leagues and a halfe. Your Cards bee moſt commonly made in Liſhborne, in Portingal, in Spaine, or elſe in France. But as I take it, we in England would allow 60. miles to one degree, that is, after 3. miles to one of our Engliſh leagens, wherefore 20. of our Engliſh leagues ſhould anſwer to one degree, for that 3. of our miles will not make one of their leagues, and becauſe they make their accounts by their leagues in the Cards, and not by ours, therefore I will ſhew you by our Engliſh miles. An Engliſh mile containeth a thouſand paſes, and euery paſe 5. foote, and euery foote 12. inches. Now ſome thinke that a paſe cannot be 5. foote, but a paſe Geometricall is two reaſonable ſteppes, for it cannot be a paſe vntill the hinder foote be remoued forwards, and thoſe two ſteppes will containe fiue foote, and ſo may any man endure to goe at pleaſure. But now to our purpoſe. For the ſailing of one quarter of the compaſſe, this is to be noted. Firſt, that in ſailing directly South or North, you doe raiſe or lay the Pole a degree in threeſcore miles going. In the altering of one point from the South or North you raiſe or depreſſe the Pole one degree in threeſcore and one miles: and you be departed from the line of the North and South, or the Meridian 12. miles. In altering of the ſecond point you raiſe a degree in ſailing threeſcore and fiue miles: and depart from your Meridian 25. miles. In altering of the third point you do raiſe or lay one degree in ſailing threeſcore and 12. miles,

In going to the Northwards raiſe the pole and lay the Equinoctiall.

Of Engliſh leagues & Spaniſh leagues.

A degree is 60 miles or twenty Engliſh Leagues.

and a ninth part: and are departed from your Meridian 40. miles. Moreouer in altering of the fourth point you doe raise or lay a degree in the going of fourescore and fiue miles: and depart from your Meridian threescore miles. In altering of the fift point or wind, you raise a degree in the sailing of 108. miles: and depart from your Meridian fourescore and tenne miles. In sailing by the sixt point, you raise or lay one degree in 157 miles: and depart from your meridian line 145. miles. Last of all, in sailing by the seuenth point or wind, you do raise a degree in going of 308 miles, and depart from your Meridian line 302. miles: and after this manner you may consider of ỹ other three quarters of the Compasse But if you require to know the raising or laying a degree by the leagues of the Cards, that is, at 17. leagues and a halfe: then behold the figure following, or read the Art of Nauigation, & there shall you find how many degrees you are departed from your Meridian, and also from the place that you departed from: and yet that serueth for none other place but onely for vnder the Equinoctiall, for he that maketh account of it in any other place, shall bee deceiued: For euer as you goe to any of the two Poles, your degrees still bee shorter and shorter, till such time as your Meridian meeteth vnder the two Poles, whereof I intreat in the sixteenth Chapter.

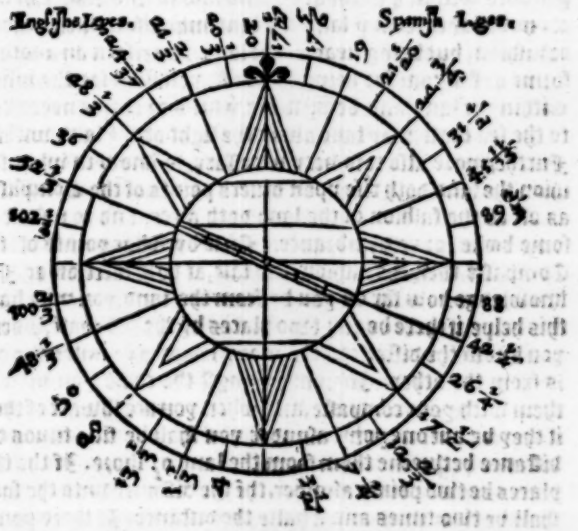
A note to know in how farre sayling you doe raise or lay a degree in the sayling by any one point of the Compasse.

Marke this well.

For the better vnderstanding of the things aforesaide, loke on this figure following. In the which figure you are to note this, that the numbers which are set vpon the vppermost quarter of the circle towards the left hand, expresse the English league, which wee must runne vpon each seuerall point of the compasse before wee can raise or let fal the Pole a degree. The other number on the right hand are the Spanish Leagues seruing to the same purpose. The numbers set on the nethermost quarter of the circle towards the left hand, expresse the distance in english leagues from the Meridian, when we haue raised, or let the Pole fal a degree,

but

but those on the right hand are the Spanish Leagues, expressing the same distance.



The 14. Chapter teacheth to know how farre any land is off from you, knowing but the distance betweene any two places: whether you run along by the land, or directly to the shore, or otherwise, with other necessary things.

FOr that I know it bette necessary and profitable for Sea-men to know how nére or how farre they be unto the Sea, and how nére to the land, I will intreate thereof for diuers considerations. And first, because

in runing alongst the land there may be danger, because it may be such acertaine quantitie into the sea that they may goe both within & without it. And also in like maner, being at one distance from ỹ land, the land may rise in such a shape or fashion, but being neater, the land may rise in an another forme or fashion: for being farre off, you shall see the hilles within the land, and being neere, ỹ hills or cliffes neere vnto the sea coast, may take away the sight of the land within.

A note for the land rising in diuers shapes or fashions.

To know how far the land is from you where two Lands be but one point asunder.

Furthermore also it is very necessary, to know in what fashion the land doth rise vpon diuers points of the Compasse, as oft as the fashion of the land doth alter, and to note it in some booke for remembrance. First by what points of the Compasse then the fashion, and last, at how farre off &c. For knowledge how far off you be from the land, you may haue this helpe, if there be any two places by the sea coast, whereof you know the distance, how many leagues or miles the one is from the other. In going alongst the coast you sh aset them with your compasse, and when you are thwart of them if they be but one point asunder, you shall be fiue times the distance betweene them from the land or shore. If the two places be two points asunder, thē the distance vnto the shore shall be two times and a halfe the distance. If three points asunder, then the distance vnto the shore shall be once the distance and a half. If foure points asunder, the same distance shall be between you & the shore, that is betweene the two markes. If fiue points asunder, then is it vnto the shore but two third parts of the distance betweene the two places. If sixe points asunder, (you being thwart of one of them) then shall the distance vnto the shore be, not halfe the distance betweene the two places. And in all these cases before rehearsed, the one place must be thwart of you, the other must be a head or stearne of you: and so it is exact and true. As for ensample thus: I going alongst by some coast, not knowing before hand one place to beare from another East and West: besides this also I know the distance to be three leagues asunder. When I haue brought one of the places South or

North

North of me, I doe set them with my compasse; the one being North of me, and the other bearing North by East, that is one point asunder: Now the distance vnto the shore being fiue times the distance betweene the two places which be three leagues asunder, I know the shore to be 15 leagues from me, which (if the places were but one league asunder) should be but fiue leagues from the shore. Of two places to be one point asunder.

Furthermore, if the places be two points asunder, that is to say, the one North, and the other North Northeast, then shal the distance vnto the shore be seuen leagues and a half from mee. Whereas if the two places were but a league asunder, it should be but two leagues & a halfe vnto the shore. To bee two points asunder.

And furthermore, if the places be 3 points asunder, that is to say, the one North, and the other Northeast & by North, the distance vnto the shore shal be foure leagues and a halfe: whereas if the two places were but one league asunder, vnto the shore it should be but a league and a halfe. Three points asunder.

If 4. points asunder, that is to say, if the one place be due North, and the other place Northeast, then is vnto the shore three leagues iust. If but one league asunder, then but one league vnto the shore. Foure points asunder.

Moreouer if the two places be 5. points asunder, that is to say, the one North, & the other Northeast and by East, then the distance unto the shore shall be but two leagues: whereas if the two places were but one league asunder, vnto the shore should be but two miles. Five points asunder.

Last of all, if the two places be sixe points asunder, that is to say, the one North, & the other East Northeast then it shall not be a league and a halfe vnto the shore, &c. Sixe points asunder.

But if you come directly to the landwards, hauing no cause to be thwart of none of those known places, then to know how farre you bee from the land, you must do as is by the places before spoken of. For if you goe due North, the one place being North and by West, and the other North and East, then (the two places being three leagues asunder) you shal be seuen leagues and a halfe from the shore: so that if you run into the shore due North vntill they be foure points asunder, that is to say, the one North Northwest, Of going or sailing into the shore.

Northwest, and the other North Northeast, then it shall be vnto the shore three leagues, and three quarters.

And further more, you still running in due North till the two places be 6. points asunder, that is to say, the one place to bee Northwest and by North, and the other place to bee Northeast and by North, the distance vnto the shore shall be two leagues and a quarter. And againe, if you runne in due North vntil they be eight points asunder, that is to say, the one place Northwest, and the other Northeast: then the distance vnto the land or shore shal be but halfe the distance betweene the two places, that is, but one league and a halfe. Lastly, if you runne to the land due North, vntill the two places be tenne points asunder, that is to say, the one place Northwest and by West, and the other Northeast and by East, then the distance vnto the shore shall be but one third part of the distance between the two places, that is, but one league from the land, &c. Thus much haue I said touching the bearing of the land from you, by the points of the Compasse, to know the distance, or how farre the land is off: which is very necessary for Sea men to know, for diuers considerations, as I said before.

Away to know how one head-land beareth of another.

If now therefore you know not how one head-land doth beare from another, doe thus: in running alongst the coast, when you see the appearing of any land one before another, set them with your Compasses, and looke how they beare from you, by what point of the Compasse, and so shall you know iustly how the one land doth beare or lie from the other. And by this order you may correct your plats, by doing this, as often as you see two notable places together: As Ilands, Rocks, Head-lands, mouthes of hauens, Sands, or whatsoeuer else be worthy of noting; this done, as often as you doe see them together, set them with your compasse, and that will shew you most certainly, that so they doe beare the one from the other.

To know the distance at sea.

You may know ỹ distance in like manner between them, if you know your ships way, as thus: whē you first see any two

two places together, as two head-lands or two Ilands, hauing set them with your compasse, & knowing how the one beareth from the other, then for that you will not come neer vnto them, you do hale of from the land vntil that you haue brought your selfe farre enough off at your discretion; and when you be thwart of the first head-land, set the other land & consider how it beareth from you: then reckon your ships way, how many leagues the ship might goe, vntill you come thwart of the other head-land, keeping your course along as the two head-lands beare, and so shall you both know the distance betweene the two places, and also how farre you be off from them. In like manner, hauing consideration of the distance betweene the other places that you haue obserued, both by your compasse, and also by the shipes way, you may know how farre it is to the shore, going right to the landwards, by your crosse staffe, although you know not the distance betweene any two places.

betweene any two headlands

To know how farre it is vnto the land another way.

To know the ships way.

And thus: take the wideneſſe betweene any two places with your crosse staffe, bearing right to land wards, and then remoue the crosse staffe or Transuersarie, halfe the length of the Transuersary that is to say, the end nert vnto you; and then by running in, till the two ends of the Transuersary doe agree with the two markes, you shall bee halfe way to the shore, then loke how farre the ship hath gone in the time, for the same distanc is vnto the land from the ship. But if you remoue the Transuersarie but a quarter the length thereof to you wards, then at the place where the end of the transuersary doth agree with the two markes, shall be one quarter of the distance betweene the shore and you at the first obseruation: and it shall be three times the quantitie vnto the shore, &c.

As I doe farther shew the conclusions of the crosse staffe in my booke called The Treasure of Trauailers, the first booke the 10. 11. 12. 13. and 14. Chapters. And to know the shippes way, some doe vse this, which (as I take it) is very good: they haue a peece of wood, and a line to vere out ouer

To know the ships way.

wood of a great length, which they make fast at one end, and at the other end, & in the middle, they haue a peece of a line, which they make fast with a small thread to stand like vnto a crowfoot: for this purpose, that it should driue a stearne as fast as the ship doth goe away from it; alwayes hauing the line so ready that it goeth out so fast as the ship goeth.

In like manner they haue ether an houre glasse of a minute, or else a knowen part of an houre, by some number of words or such other like, so that ỹ line being vered out, may be stopt iust with the time that the glasse is out, or the number of words spoken, which done, they hale in the logge or peece of wood againe, and loke how many fadame the ship hath gone in that time: that being knowen what part of a league soeuer it be, they multiply the number of fadames, by the portion of time or part of an houre. Whereby you may knowe iustly how many leagues and parts of a league the ship goeth in an houre, &c. As for example this, hauing a minute glasse (but it is better for to haue a portion of time by some number of words, and the lesser part of time that you haue it is the better, for if that the ship doth go very fast, you shall not haue too much line out, and if that the ship doth go but slowly, then you may double the length of time by speaking the words twice or thrice ouer) let downe your logge handsomely into the water, and then let the line be marked according vnto the ship, a two or thrée fadame from the log accordingly, that it be so farre a stearne that it commeth into quick water, that the edie of the stearne doth not stay it; that being done, then begin to turne your glasse, or to speake your words, and stay it, iust at the end of the words, and then hale in your logge againe, & measure how many fote or fadames that you haue vered or put out in that time, and suppose that your portiõ of time is 120 parts in an houre, more or lesse it maketh no matter, so ỹ you do know the iust portion of time.

An English League is 2500 fadame.

A Spanish League is 2857 fadame.

Additions.

And suppose that you haue vered 25. fadames in the 120. parts of an houre, therefore multiply 120. by 25. and of that multiplication there commeth 3000. fadame, and now an

English

English league is 2500. fadame, so that the shippe hath gone one league and 500. fadames in an houre, and the saide 500 fadams is the fifth part of a league, so that the ship hath gone one league & one fifth part of a league in an houre. And this by multiplying the portion of time by the number of fadams you may keepe a very good reckoning of your ships way, hauing this consideration, that you doe make as oftentimes prowfe as the winde doth increase or decrease. Additions.

And for a good order in the keeping your account, doe this: Loke how long time that the winde hath blowne steddely without any increasing or decreasing, or altering of your course, then when that you doe see what or how many fadames that the ship hath gone in an houre, multiply the said number of fadames by so many houres as the ship hath gone by the said winde, and then divide all that sum by 2500. or else it is better to adde all your number of fadams as long as the shippe hath gone one course without altering: as for ensample this. The ship hath gone foure houres 25. fadame, in the time of 120. part of an houre, that is in 4. houres 12000. fadame, & the wind encreasing she went three houres 34. fadames, in 120 part of an houre, that is in 3. houres 12240. fadames, and the wind decreasing, the ship went 5. houres, but 16. fadames, in the 120 part of an houre, that is 9600. fadame in fiue houres, now adde all these numbers of fadams together, that is, 12000. and 12249 and 9600. and all these make 33840. So that the ship hath gone 12. houres 33840. fadames, and now vnide this summe by 2500. which is a league, and then there will stand 13. in the quotient, and 1340. remaineth ouer. So that you may conclude, that the ship hath gone 13. leagues and a halfe, and 90. fadames: and by this meanes you may kep a very good order in your reckoning, and so note it in your booke, and make a marke in your Cart, &c. And this is to be noted, that a Spanish or Portugall league doth containe 2857. fadames, and an English league but 2500. fadames.

The

The xv. Chapter or Rule, teacheth of the Longitude, &c.

NOw some there be that are very inquisitiue to haue away to get ẏ longitude, but ẏ is too tedious for Seamen, for that it requireth the deepe knowledge of Astronomy. For this they must consider, that the whole frame of the firmament is carried round from the East to west, in 24. houres, so as there remaineth neither light nor marke, but goeth round, sauing onely the two Poles of the world, and these two stands alwayes fast. But as I said before in the 9 rule of him that goeth South or North, doth raise or lay the Pole, and in like case the Equinoctial altering his Parallel and causing the lights of the firmament to alter the time of their shining or abiding aboue our Horizon: so he that goeth directly East or west, doth neither raise nor lay the Pole, so that still the lights of the firmament doe make one manner of Arch, according to their Latitude or declination: but the going East or west doth alter the Meridian, causing the Planets to haue their aspects at another houre or time, altering the time of the Eclipses: which is necessary for all trauellers by sea or by land to know. Therefore I thought it needfull to be spoken of: for as countries haue Latitude from the Pole, so in like maner they haue an appointed lõgitude, you may get the Latitude with instrumẽts, but the Longitude you must bring from another place, which you cannot do but with a Globe or else a Map or Card, & then you must measure frõ the Meridian of the Canary Ilands, otherwise called the fortunate Ilands. And in our Latitude of London, euery 560 miles which containeth 15. degrees. will answere to one houre of time: and vnder the Equinoctiall 900. miles to 15. degrees: the degrees of Longitude vnder

Altering the time of rising and setting of the lights.

Altering the aspects.

Of Latitude & Longitude:

15. degre is an houre of time, & at London it is 560. miles.

vnder the Equinoctiall, be as long as the degrées of Latitude but, towards the Pole they are lesser and lesser, they come to nothing vnder the two Poles, with vs at London 37. miles will answer to one degree of Latitude, the Pole being raised betweene 51. and 52. degrees. The cause why the Longitude was fetcht from the Canarie Ilands, I knowe not, but it was as I suppose, because it was the westermost place then knowne: for Ptolomeus was the first that ordained that rule. Longitude beginneth at the Canary Ilands.

Now furthermore, because you shall know this thing the better, I haue set forth in my 2. book, called the Treasure for trauailers, certaine principal places in the whole world, both according to their Longitude & Latitude, whereby you may knowe what manner of Arch the Sun with the other lights doth make, & also by the Longitude, you may know at what time the Moone doth make an aspect with any of the Planets. Besides this, you may know the Eclipses of the Sun or Moone, with the Change quarters, and full Moone in all places at the verie true houre and minute of time. If you haue a true, and an exact Ephemerides, & consider diligently for what Longitude or place your Ephemerides was made. The Longitude may be found at the time of the Eclipses of the Moone, so that she be aboue your Horizon in any place vpon the superficies of the earth, or sea in this manner. To know the true time of the aspect of the Moone.

Séeke out in the Ephemerides, the time of the Eclipse, obserue also diligently the iust time, wherein you see the Moone Eclipsed, compare the said time with the time set downe in the Ephemerides, if they doe both agrée, then are you in the same Longitude, and vnder the Meridian of that same place for the which your Ephemerides was made. But if the two times compared together doe differ, then are you either to the East or Westward of that place, for the which your Ephemerides was made. If the time wherein you obserued the Eclipse be lesser then that, which is set downe in the Ephemerides, then are you to the Westward, but if it be greater

greater, then are you to the eastward of that place, for which your Ephemerides was made. How much you are to the east or Westward may easily bee knowen by the difference of time, and the degrées of Longitude answerable there vnto. Vnto euery houre there are ascribed 15. degrées, to euery halfe houre seuen degrées & a halfe, & so consequently following that rate as the difference of time is more or lesse. If the time noted in the Ephemerides doth differ an houre from ẏ time of your obseruation, then doth the place wherein you obserued the eclipsdeffer in longitude from the place, for the which the Ephemerides was made, 15. degrées; if two hours then is the difference of Longitude 30. degrées, &c. These degrées answerable to the difference of time, and expressing the difference of Longitude must be subducted if your obseruation of the Eclips were made to the westward, otherwise they must be added to ẏ longitude of the place, for the which the Ephemerides was made, so shall you find the true Longitude of the place in the which your obseruatiō was made.

And furthermore you might know your Longitude with the Ephemerides, by the coniunction of the moone with other fixed starres, if it were not for oye great infirmitie, and that is the parallex of the Moone, which the semi-diameter of the earth doth cause, by neernes of the moone vnto the earth: wherefore I would not haue any man thinke that the Longitude is to be found at the sea by instrument. Therfore let no Sea-men trouble themselues with any such rule, but (according to their accustomed manner) let them keepe a perfect account and reckoning of the way of their ship, whether the ship goeth to leewards, or maketh her way good, considering alwaies what things be against them or with them, as tides currents, winds, or such like.

The Longitude is not to bee gotten with instruments on the Sea.

The

The xvi. Chapter ſheweth how many miles will anſwere to one degree of Longitude, in euery ſeuerall Latitude, betweene the equinoctiall and any of the two poles: with the demonſtration for that purpoſe, and the diuerſitie of aſpects of the Moone.

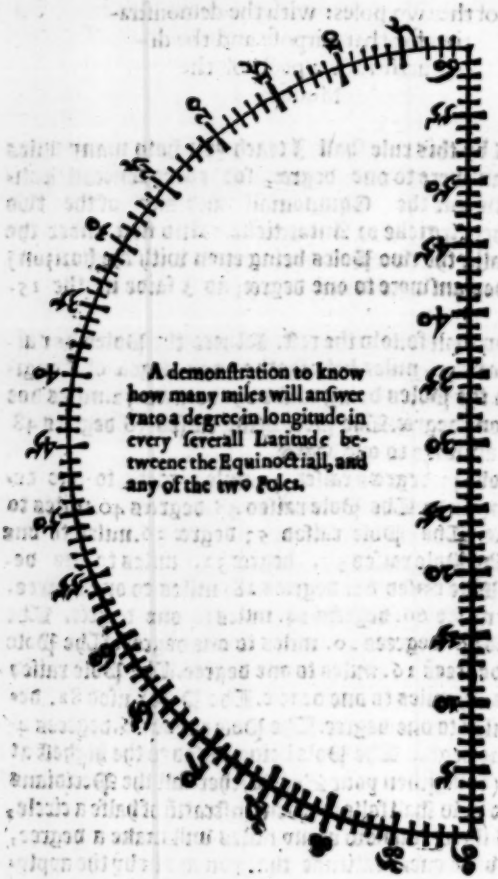
NOW by this rule ſhall I teach you how many miles will anſwere to one degrée, for euery ſeuerall Latitude, betweene the Equinoctiall and any of the two Poles either Articke or Antarcticke. And firſt vnder the Equinoctiall, (the two Poles being euen with the horizon) 60. miles doe anſwere to one degrée, as I ſaide in the 15. Chapter.

And now ſhall follow the reſt. Where the Poles be raiſed 21. degrées 56. miles belongeth to one degrée of Longitude. Now the Poles being raiſed 29. degrées 52. miles doe anſwer to one degrée. The Pole being raiſed 36 degrées 48 miles doe anſwere to one degrée.

The Pole 42. degrées raiſed 44. miles goeth to one degrée of Longitude. The Pole raiſed 48. degrées 40. miles to one degrée. The Pole raiſed 53. degrée 36. miles to one degrée. The Pole raiſed 57. degrée 32. miles to one degrée. The Pole raiſed 62. degrées 28. miles to one degree. The Pole raiſed 66. degrées 24. miles to one degrée. The Pole raiſed 70. degrees 20. miles to one degrée. The Pole raiſed 74 degrees 16. miles to one degree. The Pole raiſed 78. degrées 12. miles to one degrée. The Pole raiſed 82. degrees 8. miles to one degree. The Pole raiſed 86. degrees 4. miles to one degree. The Pole being raiſed to the higheſt at 90. degrees (being then your Zenith) there all the Meridians meete. And now ſhall follow a demonſtratiõ of halfe a circle, that ſhall ſhew you how many miles will make a degree, according vnto euery latitude that you are in by the applying of the one foote of a paire of Compaſſes, or by making a

thread,

thread fall to the lower corner of the halfe circle at 90. and by extending of the other foote of the compaſſe, or by laying



A demonſtration to know how many miles will anſwer vnto a degree in longitude in every ſeverall Latitude betweene the Equinoctiall, and any of the two Poles.

the

the thread vpon the latitude of the place wherein you are, the which Latitude or elevation of the Pole is marked by seuerall degrees in the halfe circle, and in the Diameter are marked the miles answering to euery degree. Your compasses therefore being extended, or the thread being applied from 90. to the Latitude of the place wherein you are, turne the Compasses or the thread downward to the Diameter, for the number vpon which the fet of the Compasse, or the end of the thread lighteth, expresseth the miles answerable to each degree of Lattitude in the Parallel of the Latitude propounded. The reason is this, because al circles be in proportion correspondent vnto their Diameters. Now you must consider (as it was partly noted before) that vnto euery houre of time in the changing of the Mone or of the Eclipses, you must allow 15. degrees, and vnto euery degree you must allow so many miles as you doe se in your former instrument to be answerable to the latitude of the country, in this manner: those places that be to the Westward of your towne, place, or countrey, by 15 degrees, the Mone shall change sooner with them then with you by one houre, because that the mone shall touch your Meridian before theirs by one houre. And if the towne or place be to ỹ Eastwards of you by 15. degrees, then shall the Mon change sooner with you than with them by one houre, as for ensample thus. If so be that with vs at London the Mone shall change vpon any day at 12. of the clocke at none 16 degrees 50. min to the Westwards as farre as Lisshborne in Portugall, the Mone shall change that same day at 11. of the Clocke 17 minutes, the Longitude being thereof from the Canary Ilands fiue degrees, 36. minutes. Now to the Eastwards, the same day at Rome the Mone shal change at one of the clocke 47. min: because that they haue Longitude 32. degrees, 26. minutes from the Canarie Ilands, & then by this account 7. degrees and a halfe will answer to halfe an houre, and then three degrees & three quarters will make a quarter of an houre, and then nine miles and a quarter will make one minute of time

15 degrees answereth vnto an houre of time.

with

with vs at London in our latitude, so by this rule you may know at what time and minute the Eclipses or changes of the Moone doe happen, knowing for what place your Almanake was made, as commonly we here in England do make them for the City of London.

Thus much haue I said as touching the true time of the chang of the Moone, for that same people (as I haue said before in the third Chapter) do cõtemptuously say, why do they not giue or make rules for euer, to know the houre and minute of the change, full, and quarters of the Moone: And yet the be vtterly void of any knowledge in the Mathematicall science, whereby they might know the true time of the change of the Moone: For it is aquestion Astronomicall, to know the Moones motion: a question Geometricall, to know the true time of the aspects, or measure betweene the Sunne and the Moone: and thirdly it is a question Cosmographicall, to know the true Logitude of the place he is in, at the time when the Moone changeth, &c.

To know the true time of the change & quarters of the Moone, is a question Astronomicall, and Cosmographicall,

Now followeth the next rule which shall treat of Longitude and Latitude.

The seuenteenth Chapter sheweth the Circumference of the whole Earth and the Sea, vnder sundrie Parallels: whereby that any Sea-man may know what quantitie or part of the earth that hee hath sailed, or passed, by the number of leagues, and also he may know the alteration of time, &c.

Additions.

AND now furthermore I doe thinke it necessarie for to shew the Circumference of the whole earth, in sundry Latitudes from the Equinoctiall, wherby in sailing, you may know what quantitie or part of the whole earth you haue passed or gone, and also what the diuersity, aspect, or time

is

is wherein you haue transported your selfe from a place assigned, which is necessarie for them that should goe any long voyage.

Vnder the Equinoctiall the whole earth is in circumference 7200. leagues, attributing 20. leagues to a degree, and the halfe thereof is 3600. leagues. In that parallel it is mid-night to one, when it is high noone to another, and the quarter of a compasse is 1800. leagues, and there the diuersitie of time is altered sixe houres, and then in 900. leagues the time is altered three houres: so that in the sailing East or west vnder the Equinoctiall, three hundred leagues shall alter one houre of time in the Eclipses or the changes of the Moone, &c.

Furthermore, where the Pole is raised 20. degrees aboue the Horizon round about the earth keeping the parallel, the whole compasse is 6766. leagues, and the halfe of it is 3383 leagues, and there your noone is midnight, and then a quarter of that parallel is 1691. leagues and a halfe, and there the alteration of time is sixe houres, and then 846. leagues doth alter three houres of time, so that 282. leagues doth alter one houre, in the change or Eclipses of the Moone, &c.

In the Latitude of 30. degrees from the Equinoctiall, the compasse of the earth vnder that parallel is 6236. leagues. and the opposite part in that parallel is 3118. leagues, and there noone is midnight, and then the quarter of the compasse of the earth is 1559. leagues, and then passing in that Parallel 779. leagues and a halfe. doth alter three houres of time: so that 260. wanting $\frac{1}{3}$ leagues, shall alter one houre in the aspects of the moone, and also in the Latitude of 40. degrees from the Equinoctiall, the whole compasse of the earth and sea vnder that Parallel is 5516. leagues: So the halfe is 2758. leagues, and a quarter is 1379 leagues, so that 689. leagues and a halfe, shall alter three houres of time, & 230. leagues, will alter one houre of time in the eclipses or aspects of the Moone, &c.

Where the Pole is raised 50. degrees, there the circum-

ference of the whole earth vnder the Parallel is 4628. leagues and a halfe thereof is 2314. leagues, and the quarter thereof is 1157. leagues: so that 578. leagues and a halfe, doth alter three houres of time: and 193. leagues doth alter one houre of time in that Parallel. In the Latitude of 60. degrees from the Equinoctial in that parallel, it is but 3600. leagues to goe round about the whole earth and sea, so that 1800. leagues is the opposite part of that Parallel, and there your none is midnight; so that 900. leagues shall alter fiue houres of time, and 450. leagues, three houres of time, and 150. leagues shal alter one houre of time in the aspects of the moone being the 24 part of the compasse of the earth in that Parallel &c.

Where that the Pole is raised 65 degrees, there the circumference in the Parallel is 3042. leagues, so that the halfe is 1521. leagues, and a quarter of that Parallel is but 760. leagues and a halfe: So that 380. leagues shall alter three houres of time, and 126. leagues and ½ shall alter one houre of time, &c.

And and also in the Latitude of 70. degrees, the compasse of the earth is in the Parallel 2462. leagues, so that the opposite part is 1231. leagues, & the quarter is 615. leagues and a halfe, so that 307. leagues and three quarters, doth alter three houres of time, and 102. leagues will alter one houre in the eclipses or change of the Moone. And furthermore, in the Altitude of the Pole 75. degrees, there the compasse of the earth in that Parallel, is 1864 leagues, and the halfe is 932. leagues, and the quarter is 466. leagues: so that the alteration of three houres of time is 233. leagues, & 77. leagues, & 2 miles will alter an houre of time, &c. And also in the Latitude of eighty degrees from the equinoctiall, there the whole circumference of the earth vnder that parallel is but 1250. leagues. And the opposite part in that parallel is 625. Leagues, and then the quarter of that, is but 312. Leagues and a halfe, so that 156. Leagues will alter three houres of time, and fiue and twenty leagues will alter one houre,

houre in the time of any Eclipse or any aspect of the Moon, so that you may see how short that the Circumference of the earth is at the Latitude of eightie degrees: and this I doe cease to shew any further towards the Pole-wards, for that it is doubtfull whether that it is Navigable so neere vnto the Poles, &c.

The eighteenth Chapter or rule, sheweth how to saile by the Globe.

NOW to sayle by the Globe, it is conuenient to bee spoken of: For that generally the most part of the Sea-men make their account as though the earth were a flat forme: for they do not consider that the earth is a Globe, and that the Meridians doe grow narrower and narrower towards the poles, for it is impossible to draw the face of the earth and the Sea true vpon a platforme, for if you will describe the land true, then shall not the Sea be true if your lines be made according to the art of Hydrography, for the Sea shall be broader to the North parts then it is, because the Meridians grow together. Now and if you would describe the sea true, with lines, courses, distances, hauens, and dangers, then should your land bee broder to the north parts then it is. As for ensample thus: England and Scotland being both one Iland, in all your Cardes of Navigation, that doth shew any part to the Southwards the North part of Scotland is drawne much bigger then it is, for otherwise the lines of South and North should not be according to the trenting of the land, for if you view it well you shall find the North end of Scotland much more in distance then it is. As you may see in measuring it by the truncke of your carde.

You cannot draw the land & Sea true vpon a flatting.

To make a sea-plat or Card.

For your better vnderstanding, I haue shewed the compasse of the earth vnder sundry Latitudes in the Chapter going before, and by that you may see that the compasse of the East and West line (comming from the Equinoctiall)

is much lesser to the Northwards, then it is to the Southwards. Wherefore when you shall haue an occasion to attempt any voyage to the North parts, it is best to sayle by a Globe, for so shall you better see the distance and bignesse of the lands, and in like manner your lines and courses In this order, first (according to the accustomed manner) keepe a perfect account and reckoning of the way of the ship, by what line or point your Ship hath made her way good, then must you resort to your globe: after that consider what place and parallel you be in, which you may doe by the Sunne by day, and by the starres by night. Now (knowing what place and parallel you be in) set your Globe to the eleuation of your Pole: that done, turne to the place of your Zenith, and seeke the opposite of it in your Parallel: for then you know that in the same parallel is your East and west line: that had, the iust quarter of that circle to the Pole, must bee diuided into the eight points of your compasse, doing so likewise on the other side.

How to vse the Globe to direct your course, & to know how that any place dorh beare.

In like case if you come to the Southwards, diuide your eight windes from your antarticke Pole, to your Parallel circle: and thus must you doe euer ꝯ auon, for the oftner you doe obserue this custome, the better and perfecter shall your course be. Now thus briefly I make an end of the sailing by the Globe. But for them that do occupy the South parts, nothing is better then their cards. Because I haue declared vnto you ẏ length of certaine of the parallels, what leagues the earth doth containe in compasse vnder them, now will I shew you how many leagues distance there is, from one parallel vnto another, accordingly as I haue set downe in the chapter next going before this, where I do shew the circumference first vnder the Equinoctiall, and then the latitude of twenty degrées, and then 30. degrées, &c. First from the Equinoctial vnto the latitude of twentie degrées is 400. leagues. and from 20. degrées vnto 30. degrées in latitude, is 200 leagues. The like is from 30. vnto 40. degrees, and from 40. to 50. and from 50. to 60. So that there is from the

the Latitude of 60. degrees vnto the equinoctiall 1200. leagues, & there a degree of Longitude is but halfe so much as it is vnder the equinoctiall, and the whole circumference of the earth but halfe so much in like manner from the Latitude of 60. degrees vnto the Pole is but 600. leagues, and there all the Meridians doe méete: and it is from the Equinoctiall vnto either of the two Poles of the world 1800. leagues, &c. which is the fourth part of the Compasse of the whole earth.

Furthermore, for that you may the better vnderstand, that the earth is a globe or circular (which any person that doth occupie the Sea, seeth most apparently) you shall perceaue it thus; if you see a ship any thing farre off, you may perfectly see the saile of it, but not the hold, the cause whereof is the circularnes of the earth, and the water of the Sea: for that the water doth arise and swell betweene you and the other ship, according to the distance betweene both the ships, because the distance to the Center of the earth, or Water, is in euery place alike. And hee that hath desire to know further hereof, M. Dee hath made mention thereof in Euclides Elements, in his Mathematicall preface, and also in the twelfth booke, whether you may haue recourse: yet notwithstanding I will say a little thereof, whereby you may discerne how farre it is possible to see a ship vpon the sea: if you be on the sea in a ship, so that there be but halfe a league betweene you & the other ship, the water will be fiue ynches and a halfe higher in the middle of the way betweene both the ships; for that the water is of equall distance in euery place from the center of the earth, and runneth in a croked line, the which croked line being subtended by a right line, the middlemost line betweene two shippes that commeth from the center of the earth, shall be shorter then the other two lines comming from the center of the earth, vnto the two shippes, by fiue ynches and a halfe; then it must needes be said, that the water is higher by the saide fiue ynches, and a halfe. And furthermore if the two Shippes were a leagne

The cause why that you may see the sailes of a ship, and not the hold.

asunder, then the water by his circularnesse should be 22. inches higher than the leuell in the middle betweene both the Shippes.

To know how many foot and ynches the water is higher than the levell of the Sea, betweene two ships,

Furthermore, if the two Ships be two leagues asunder, then the water shall be higher than the leuell in the middle betweene both the ships, by 88. ynches, which is seauen foote and foure ynches. If the two ships be three leagues the one from the other, then the water shall be higher then the leuell in the mid-way betweene both the Ships by 198 ynches, which is 16 foote and a halfe.

Furthermore, if the two ships be foure leagues asunder, the water shall be higher then the leuell in the mid-way betweene both the ships, by 252. ynches, which is 29 foote and foure ynches. And furthermore, if the two Ships were fiue leagues asunder, the water should be higher then the leuel of the mid-way betwæn both the ships, by 550. ynches, which is 46. foot, lacking two inches. Yet furthermore, if the 2 ships were 6. leagues asunder, the water should be higher than the leuel in the middle way betwæn them by 792 inches, which is 66. foote. Furthermore also, if the two ships were seuen leagues asunder, the water should be higher then the leuel in the mid-way betweene both the ships by 1878. ynches, and that is 90 foot, which is as farre and rather farther than it is possible to see any ship vpon the Sea. Nether is it possible to see any land further, but such land as is very high land, which for the greatnesse of the height may be seene, wherefore fiue leagues or seauen leagues is called a kenne.

What a kenne is. The cause why you may see a ship farther out of the top than vpon the hatches.

Now the circularnesse of the earth is the cause why you may see a ship or land further out of the top, than vpon the hatches: wherefore it is a plaine case, that the earth and sea is not flat, but circular, as is afore declared, &c.

The

The xix. Chapter, is as touching the making of Plats or Cards for the Sea, and not to paint their Cardes as they doe, but rather to supply the vacant places with other necessary matters: and also of three necessarie things contained in the Plats or Cards, and their vses, which is the most necessary thing in Navigation.

FOR the marking of Plats or cards, as touching Hidrographie, commonly called sea Cards: I meane to say little therof: for that it is sufficiently declared in the booke called the Art of Nauigation: saning this, I would wish them that be makers of Plats & Cards for the Sea, not to paint their compasses with so many colours, neither vpon the land with so many flags, for that it doth rather hurt then good: although it may be saide, the be so painted in vacant places; those vacant places I would wish them to furnish with these two matters, in this order. First, in some vacant place to make a compasse, & to place against euery point of the halfe of the compasse, letters or some of the figures or Characters, and in like manner, to make the letter or Character at the hauen, port, or place where the moone maketh a full sea, being vpon that point of the compasse, vpon which the said letter or character doth stand; as for ensample thus: I place A. at the East point, B. at the East & by South, C. at the East South-east, D. at Southeast and by East, and so consequently to all the points vnto the West; then that being done, where it floweth at east moone, I place A. in the Plat or Card, and where an East and by South moone, I place B. in the Card, and so forth, according to the place of the moone that maketh a full sea. And where it runneth halfe tide vnder other, to make some note vpon the Card in that place, &c.

Not to paint their sea cards but to vse the vacant places with other necessary matter.

This also is very necessary to be done, to furnish vp all the vacant places of the Plat or Card, to draw the shape or fashion of euery head-land or high land alongst euery coast

To draw the shape of the land in their Cards.

that is needfull to be knowen, and at what point of the compaſſe the land is of that faſhion: at how farre off the land riſeth in that faſhion: & ſo to make a faſhion of the land as often as the land altereth the forme and faſhion: & laſt of all, at what point of the compaſſe the land hath that ſhape or faſhion; for being vpon one ſide, the land riſeth of one faſhion, and on the other ſide of another forme or faſhion.

And being neer the land, it will be in one faſhion, and being farre off in another faſhion (as is before declared in the 14 Chapter) for there is nothing more needfull and neceſſary for the Sea-men then this, to know the land when hee ſeeth it, and there is no way better to make him remember it, then to haue notes how the land doth riſe vpon euery ſide, and what greater inconuenience may there grow by any meanes, then there may bee by miſtaking of a place; for it were twenty times better to be throughly perſwaded, that hee knoweth it not, then to thinke he doth know it, not being that place. For whereas he doth thinke to preuent the dangers, he may willingly runne vpon the dangers, not known of him. Therefore in my oppinion they can do no better then to furniſh their vacant places in their Plats and Cards with this matter. The vſe of the Sea Cards is moſt neceſſary for Nauigation for long voyages: firſt, for that it ſheweth you how one place beareth from another: ſecondly the diſtance of any place how farre the one is from the other: Of which the one repreſented by the lines of the compaſſe, the other by the ſcale or truncke of meaſure, if the Plat bee truely made: thirdly, it ſheweth you in what Latitude from the Equinoctiall or Altitude of the Pole any place is in, by the line of degrees.

Great infirmities by miſtaking any place.

How neceſſary a thing the ſea Cards be.

Three neceſſary things in the Sea Cards.

Now to direct your courſe through the ſea by your card, to any place aſſigned, you muſt firſt lok by what point of the compaſſe it beareth from you, frō the place you meane to ſet off from the land, vnto the place you would firſt fall with. Which you ſhall know thus; ſeeke a line from the next compaſſe, vnto the place you meane to depart from, thē open your

To know how any place doth beare from you by the Card

Compaſſes

Compalles vnto one of thoſe lines by your iudgment that falleth nére vnto your place aſſigned: and let the other fot of your Compalles ſtand iuſt at the place where your Ship is, when you direct your courſe: that done, beare your hands forwards euen, & let the one end be ſtill vpon the line to the which you did open your compalles, vntil you come to your place aſſigned. But if it falleth ſhort of the place aſſigned, then take the next line nearer vnto the place you departed from: when you haue ſo done, if your Compalles doe ouerreach the place aſſigned, then take a line further off from the place you doe meane to ſet off from: and ſo ſhall you ſee by what point of the Compaſſe the place aſſigned doth beare from you, &c. If you would know how far the place aſſigned is from you, ſet the one fote of the Compalles vpon the place you depart from, and ſtretch out the other fot vnto the place aſſigned iuſt; that done, (keeping your Compalles at that extent) ſet them to the ſcale or trunke of meaſure, and that wil ſhew you iuſtly how many leagues it is from the place of your departing vnto the place aſſigned. If the diſtance betwéen the two places be more than the compaſſes wil reach at once, then firſt ſet your compaſſe vnto the ſcale, opening the compaſſes vnto 100. leagues more or leſſe, as your ſcale and compaſſes will giue you leaue at your diſcretion; after that, ſet the one fot at the place of your departing, and the other fot of the compaſſes right towards the place aſſigned, as often times as the diſtance betwéen the two places doth require, and then (the compaſſes being opened vnto 100. leagues) you may conclud it to be ſo many hundred leagues vnto the place aſſigned, as the compaſſes did ſhew vnto you but if there be any odde meaſure, then open your compaſſes to that quantity, and ſet that to the ſcale, and it will ſhew you the iuſt content of that meaſure, more than ſo many hundred leagues, &c. Furthermore touching the third commodity, which is to know what Latitude any place aſſigned hath: ſet one fote of the compalles vnto the place aſſigned, and open the compalles vnto the next Eaſt and Weſt line; then

To know how fa re it is vnto any place by the Carde.

To know what latitude or height of the Pole any place hath by the Carde.

then carrie that vnto the line of Degrée, keeping the foote of the Compasses vnto the East and West line, it will shew iustly the number of degrees that the Pole is aboue the Horizon.

So of these three waies, by the first is knowen by what point of the compasse any place beareth from you. By the second is knowen how farre distance it is vnto any place assigned. And by the third is knowen in what height the Pole is, in any place assigned, &c. Now this being knowen, you may with the more ease know how to attaine to come vnto the Port or place assigned.

Things to be considered by the Master or Pilot of a ship.

Yet Furthermore there is to be considered (in directing the course of a Shippe to any place assigned) what impediments may be by the way: as tides, currents, or the scantnesse of the winde, which may put the Shippe vnto the leewards of his course, as also theisurging of the Sea: and all this must be considered by the Master and Pilot of the ship. Likewise also in long voyages, the winde may often shift vpon him, and somtime the winde may be such as he cannot lye his course: wherefore he must keepe a perfect account of the Shippes way, and consider what point the Shippe hath made her way good by. And at euery time that the winde doth shift, and the Ship cannot lye her course, to note in the Card or Plat in what place the Ship may be: in hauing a speciall regard vnto the way of the Ship, as touching the swiftnes or slownes that the Ship goeth. And if so be the

They may correct the ships way by the taking the height of the Pole.

weather be cleare eyther by night or day, to take the true Altitude of the Pole: for by that they may correct the Ships way, and giue a very neere gesse, how the place (assigned to goe vnto) doth beare from them, as also how farre it is thither, sauing only in the East and West course and then they haue no other helpe but onely the very account of the Ships way.

And to correct their dead reckoning by the Altitude of the Pole, they must doe this: especially if the Ship haue had often trauerse, by the meanes of contrary winds, so that shee could

could not lye her course,) consider vpon the Card or Plat how long the shippe hath made her way good, for so many points as the shippe hath sailed by then (if by the Altitude of the Pole the ship hath gone more then the dead reckoning did shew you) repaire vnto the line of degrées, and set ỹ one foote of the compasse vpon the degrée & place of the height of the Pole, and the other vpon the next East and west line that done, beare it vnto the place you suppose the ship to bee in, & then bring forwards with the other Compasses, what point of the Compasse the ship hath sailed by, and at the meeting of the 2. paire of Compasses, make a note for the place that the shippe is in: from which place you may with your Compasses see, how the place assigned doth beare, and also how farre off you be from the same.

Furthermore if you find by the height of the Pole that you are not far short, as your reckoning did shew vnto you) you must pullbacke so much from the point that the shippe hath sailed by, as the height of the Pole doth shew vnto you by the order before rehearsed, &c.

To know how farre that the land is off from you by the sight of the land with your compasse, to doe it vpon the Land.

Furthermore (as I haue declared vnto you in the 14. Chapter going before) how to know how farre the land is off from you, (the distance betwéene any two places being known) by setting the land with your compasse, euen so you may do the like by your card, as thus: setting the two places with your compasse, and knowing that the two places be so many leagues asunder, then shall you repaire to the Card, and according to the bearing of the two places by the points of the compasse, you (being thwart of one of those two places) shall apply it with your Compasses vnto your Scale: But for that in the Scale the leagues be so small, you may assigne twenty leagues to be but one league, & open the Compasses vnto that proportion that the two places be asunder, and the one of them doe beare from the other: that done, open the Compasses againe from the center of the compasse, vnto the place that you doe imagine to be the land, and then apply it vnto the tenacke of measure, and you shall see how many

many Leagues you be from the shore, and so forth. So that you may see that the Plat or Card is one of the necessariest things that is to be vsed in Nauigation. If you desire a full and perfecter vse of the Card, reade the booke called The Mariners Guide, wherein the vse of the Card is handled at large.

The 20. Chapter is of the Longitude and declination of 32. notable fixed starres, verie necessary for Nauigation, with tables of their shining, and at what point of your Cõpasse they doe both rise and set: and also tables for euery moneth of the yeere, declaring at what houre and minute they be South, running from the first day of the moneth to the fifteenth, and from the fifteenth to the last day, and will continue these 100. yeeres without much error.

If the Pole be raised more then 50. or 60. degrees, it is too high to be obserued by the crosse staffe.

AND furthermore, I doe thinke it conuenient for diuers considerations, to shew the longitude and declination of certaine of the most notablest fixed Starrs that are neere vnto the Equinoctiall, to the number of 32. of them, which are very necessary for Nauigation in diuers respects, as thus: if you be vnto the north parts where the North Pole is raised more then 50. or 60. degrees, then the North starre is too high to be obserued or taken with the crosse staffe, (as I haue declared in the 1rt Chapter) and it may chance so that in the day the Sunne is not to be seene at none, and then these starres may serue your turne in the night.

These starres will serue beyond the Equinoctiall.

And furthermore they bee very good for them that haue occasion to trauaile beyond the Equinoctiall, where the North Pole is vnder the Horizon, in vsing their declination as they doe the Suns declination in all Points, which doth appeare in the 7, 8. and 9. Chapters of this booke. And furthermore

thermore they be very necessary for sea-faring men to know the houres of the night, both by their being vpon the Meridian, and also by their rising and setting: you may know the true time of their rising and setting in euery Latitude by their declination from the Equinoctiall, whether they decline to the South parts, or North parts, as is declared by the declination of the Sunne in the 11. Chapter.

To know the rising and setting of the starres in all places by the order of the xi. Chapter.

And furthermore, by any of the Starres you may try the variation of your compasse by night, &c. Now shall follow the Table of all these starres. The first row of this Table containeth the names of the starres. The second, the signes whereunto the Longitude of the starres is referred. The third, the degrees of the signes. The fourth, the minutes belonging thereunto. The fifth, the degrees of the declination. The sixt, the odde minutes belonging thereunto. The seauenth sheweth towards what part they decline, by letters, of which N. signifieth Septentrionall, or North declination; S. signifieth Meridionall, or south declination: as in the Table doth appeare. The eight doth shew nothing but the bignesse of the starres. Now followeth the Table.

The order of the Table following.

A Table.

A Table of the fixed Starres, newly corrected by T. HOOD, according to their Longitude, for the yeare 1640.

The names of the Starres.	Signes	Longit. deg. mi	Declin. deg mi.	To what part the stars decl	The mag or nights of the starres.
Whales backe	Aries	6,45	12, 20	S declin.	3 mag:
Whales belly	Aries	16, 59	12, 22	S declin.	3 mag:
Rammes home	Arier	28, 11	17, 31	N declin	4 mag:
Rammes head	Taurus	2, 40	21, 45	N declin.	3 mag:
Bulles eye	Gemini	4, 46	15, 44	N declin.	1 mag:
Orions left foote	Gemini	11, 51	8, 39	S declin.	1 mag:
Orions left shoulder	Gemini	15, 57	5, 58	N declin.	1 mag:
Orions girdle the first	Gemini	18, 28	0, 36	S declin.	2 mag:
Orions right shoulder	Gemini	23, 40	7, 17	N declin.	1 mag:
Great Dogge	Cancer	9, 9	16, 12	S declin	1 mag:
Lesser Dogge	Cancer	20, 52	6, 7	N declin.	1 mag:
Brightest in Hydra	Leo	22, 19	7, 10	S declin.	2 mag:
Lions necke	Leo	24, 33	21, 38	N declin.	2 mag:
Lions heart	Leo	24, 51	13, 42	N declin.	1 mag:
Lions backe	Virgo	6, 15	22, 30	N declin.	2 mag:
Lions taile	Virgo	16, 37	16, 36	N declin.	1 mag:
Rauens head	Libra	6, 42	20, 45	S declin.	4 mag:
Rauens wing	Libra	8, 29	15, 16	S declin.	3 mag:
Virgins spicke	Libra	18, 50	9, 14	S declin.	1 mag:
Arcturus	Libra	19, 13	21, 6	N declin.	1 mag:
South ballance	Scorpi.	10, 5	14, 29	S declin.	2 mag:
North balance	Scorpi.	14, 22	8, 0	S declin.	2 mag:
Scorpions heart	Sagit.	4, 47	25, 32	S declin.	3 mag:
Hercules head	Sagit.	11, 5	14, 52	N declin.	3 mag:
Serpent head	Scorpi.	17, 24	12, 53	N declin.	4 mag:
Eagle	Capri.	26, 45	7, 59	N declin.	2 mag:
Dolphins taile	Aquar.	9, 6	10: 0	N declin.	3 mag:
Goates taile	Aquar.	16, 48	18, 11	S declin.	3 mag:
Aquarius legge	Pisces	3, 56	18, 10	S declin.	3 mag:
Pegasus sholder	Pisces	18, 30	13, 18	N declin.	2 mag:
Pegasus legge	Pisces	24, 23	16, 9	N declin.	2 mag:
Whales taile	Pisces	27, 30	58, 91	S declin.	2 mag:

The vſe of this table is this; when you haue taken the height of any of theſe ſtarres vpon the meridian, then vnke what declination the ſtarre hath from the Equinoctiall, and whether it declineth toward that Pole, which is aboue the Horizon, or toward that Pole which is vnder the Horizon. If the ſtarre declineth toward that Pole which is aboue the Horizon, ſubſtract the declination from the meridian altitude thereof, the remainder giueth the height of the Equinoctiall. If the ſtarre declineth toward that Pole which is vnder the Horizon, adde the declination to the meridian altitude thereof, the totall ſumme giueth the height of the Equinoctiall. and then by the height of the Equinoctiall, the height of the Pole is knowne, as the ſeauenth Chapter doth declare.

How to vſe the ſtarres declination to know the height of the Pole.

And now I thinke it conuenient to make certain Tables, to ſhew vnto you at what houre & time any of theſe ſtarres be vpon the Meridian, whereby the may the better knowe theſe ſtarres, I will alſo ſhew you how long any of theſe ſtares doe ſhine or tarrie aboue the Horizon in the Latitude from the Equinoctiall of London, that is, at 51 or 52, degrees. And alſo at what point of the compaſſe any of theſe ſtarres doe riſe or ſet, which will ſerue this 100 yeeres, without much errour.

A Table to know the riſing and ſetting of theſe Starres, by what point of the Compaſſe, and how many houres they be aboue our Horizon, the Pole being raiſed 51. or 52 degrees.

THE Whales back riſeth Eaſt and by South, and vnto the Southwards: and ſhineth ten houres and better.

The Whales belly (in a maner) as the Whales back.

The Rammes horne riſeth Eaſt Northeaſt. and ſetteth Weſt Northweſt: and ſhineth 15 houres 16 minutes.

The Rammes head riſeth Eaſt Northeaſt, and ſetteth weſt Northweſt: and ſhineth 16 houres 4 minutes.

The

The Bulles eye riseth neere the East Northeast, and setteth nære ẏ west Northwest, & shineth 15. houres 2 minutes.

Orions left foote riseth nære the East and by South, and setteth nære the west and by South, and shineth 10. houres and 9. minutes.

Orions left shoulder riseth East & to ẏ Northwards, & setteth west & to the Northwards, & shineth 12 houres 45 min.

The first in Orions girdle doth rise a little to the Southwards of the East, and setteth a little to the Southwards of the west, and shineth 11. houres 46. minutes.

Orions right shoulder riseth East, and vnto the Northwards, and setteth west and vnto the Northwards, and shineth 13 houres 12 minutes.

The great Dog riseth East Southeast, and setteth west south west, and shineth 9 houres.

The lesser Dog riseth East & vnto ẏ Northwards, & setteth west and vnto the Northwards, & shineth 13 houres 10. min.

The bright est in Hydra riseth East and vnto the Southward, and setteth west and vnto the Southwards, and shineth 11. houres and 7. minutes.

The Lions neck riseth East northeast, and to the Northwards, and setteth west northwest and to the Northwards, and shineth 16. houres 16 minutes.

The Lions hart riseth nære the East Northeast, & setteth nære the west northwest, and shineth 14 houres 50 minutes.

The Lions backe riseth nære the northeast, & by east, and setteth nære the Northwest and by west, and shineth 16. houres 26. minutes.

The Lions taile riseth nære the east northeast, and setteth nære the west northwest, and shineth 15 houres 12 minutes.

The Rauens head riseth neere the east southeast, & setteth nære the West Southwest, & shineth 8 houres 12 minutes.

The Rauens wing riseth nær the East southeast, and setteth nære the West southwest, & shineth 8 houres 50. minutes.

The Virgins spike riseth East & to the southwards, & setteth west & to the southward, & shineth 11 houres 4 minutes.

Arcturus

Arcturus betweene bootes thies, riseth neere the Northeast and by east. and setteth neere the Northwest and by West, and shineth 16. houres 20 minutes.

The south Ballance riseth nére the east southeast & setteth nére the west southwest: and shineth 9 houres 36. min.

The North ballance riseth nére the east and by South and setteth nére the west and by South, and shineth tenne houres 38 minutes.

The Scorpious heart riseth nére the Southeast and by east, and setteth nére the Southwest and by west, and shineth seauen houres and fiue minutes.

Hercules head riseth nére the East Northeast, and setteth nére the west norwest, and shineth 14 houres 56 minutes.

The Serpents head riseth nére the east northeast, & sets nére the west northwest, & shineth 14 houres, 40 minutes.

The Eagle riseth nére the east and by north, and setteth nére the west and by north: and shineth 13 houres 24 min.

The Dolphins taile riseth east and by north, and setteth west and by north, and shineth 15 houres, 57 minutes.

The Goates taile riseth nére the East southeast and setteth west southwest, and shineth 9 houres, 20 minutes.

Aquarius leg riseth nére the East southeast, and setteth west Southwest, and shineth 8 houres, 54 minutes.

Pegasus shoulders riseth nére the East northeast, and setteth nér the West northwest, and shineth fourténe houres thirty two minutes.

Pegasus legge riseth nére the northeast, and setteth nére the northwest, and shineth seuenténe houres, six minutes.

The Whales taile riseth East southeast and setteth west southwest, and shineth seuen houres, forty eight minutes.

Furthermore, if you desire to know the time of any of these Starres being about the Horizon in al latitudes, then repare to the 11. chapter so you shall know it there by their Declination: euen by the same order that you know the Sunnes being aboue the Horizon, by the Sunnes declination.

The 11 Chap. will shew how long any of these starres will shine in all places.

A Table of the fixed ſtarres.

The ſtarres being ſouth frō the firſt day of Ianuary vnto the 15			Ianu. from the 15. to the laſt.			Febru. from the 1. to the 15.			Febru from the 15. to the laſt.		
Whales backe	5,20	E	1	4.20	DA	1	3,20	DA	2, 20,	DA	
Whales belly	5,54	E	2	4.54	DA	2	3,54	DA	2.54	DA	
Rammes horne	6, 28	E	3	5.28	E	3	4,28	DA	3,28	DA	
Rammes head	6,45	E	4	5.45	E	4	4,45	DA	3,45	DA	
Bulles eye	8,52	E	5	7.52	E	5	6,52	E	5,52	DA	
Orions left foote	9,23	E	6	8,23	E	6	7, 23	E	6,23	E	
Orions left ſhoulder	9,28	E	7	8.28	E	7	7,28	E	6,28	E	
Orions girdle the firſt	9,50	E	8	8.50	E	8	7: 50	E	6,50	E	
Orions right ſholder	10,12	E	9	9.12	E	9	8,12	E	7,12	E	
Great Dogge	11,4	E	10	10,4	E	10	9,4	E	8,4	E	
Leſſer Dogge	12,0	E	11	11.0	E	11	10.0	E	9,0	E	
Brighteſt in Hydra	12,4	E	12	11.4	E	12	10,4	E	9.4	E	
Lions necke	2,12	M	13	1,12	M	13	12,12	M	11,12	E	
Lions heart	2,13	M	14	1.13	M	14	12: 13	M	11,13	E	
Lions backe	3,0	M	15	2.0	M	15	1,0	M	12,0	E	
Lions taile	3,42	M	16	2,42	M	16	1,42	M	1,42	M	
Rauens head	5,2	M	17	4 2	M	17	3,2	M	2,2	M	
Rauens wing	5,19	M	18	4 19	M	18	3,19	M	2 19	M	
Virgins ſpicke	5.51	M	19	4.51	M	19	3,51	M	2,51	M	
twixt boots thighes	5,56	M	20	4.56	M	20	3,56	M	2, 56	M	
South ballance	7. 16	M	21	6.16	M	21	5,16	M	4,56	M	
North balance	7.33	MD	22	6,33	M	22	5,53	M	4,33	M	
Scorpions heart	8. 54	MD	23	7.54	MD	23	6,54	M	5,54	M	
Hercules head	9,14	MD	24	8,14	MD	24	7.14	MD	6,14	M	
Serpent head	9.41	MD	25	8,41	MD	25	7.41	MD	6,41	M	
The Eagle	12,19	DA	26	11 19	MD	26	10.19	MD	9,19	MD	
Dolphins taile	1.12	DA	27	12 12	DA	27	11. 11	MD	10,12	MD	
Goates taile	1.48	DA	28	12:48	DA	28	11,48	MD	10,48	MD	
Water pourers legge	2.48	DA	29	1.48	DA	29	12,48	DA	11, 48	MD	
Pegaſus ſhoulder	3,47	DA	30	2.47	DA	30	1.47	DA	12, 47	DA	
Pegaſus legge	4.12	DA	31	3,12	DA	31	2,12	DA	1, 12	DA	
Whales taile	4 24	DA	32	3,24	DA	32	2, 24	DA	1, 24	DA	

	March from the first to the 15.			March from the 15. to the last.			Aprill from the first to the 15			Aprill from the 15. to the last.			Maie from the first to the 15.	
1	1.20	DA	1	11.20	DA	1	11.20	MD	1	10.20	MD	1	9,20	MD
2	1.54	DA	2	12.54	DA	2	11,54	MD	2	10.54	MD	2	9.54	MD
3	2.28	DA	3	1. 28	DA	3	12,28	DA	3	11.28	DA	3	10.28	MD
4	3.45	DA	4	1. 45	DA	4	12,45	DA	4	11,45	DA	4	10.54	MD
5	4.52	DA	5	3, 52	DA	5	2.52	DA	5	1,52	DA	5	12. 52	DA
6	5.23	DA	6	4, 23	DA	6	3,23	DA	6	2.23	DA	6	1. 23	DA
7	5.28	DA	7	4. 28	DA	7	3,21	DA	7	2. 28	DA	7	1.28	DA
8	5.50	DA	8	4, 50	DA	8	3.50	DA	8	2.50	DA	8	1,50	DA
9	6.12	E	9	5,12	DA	9	4,12	DA	9	3.12	DA	9	2,12	DA
10	7. 4	E	10	6.4	DA	10	5,4	DA	10	4.4	DA	10	3.4	DA
11	8.0	E	11	7.0	E	11	6.0	DA	11	5.0	DA	11	4.0	DA
12	8.4	E	12	7.4	E	12	6.4	DA	12	5.4	DA	12	4 4	DA
13	10.12	E	13	9.12	E	13	8 12	E	13	7.12	DA	13	6.12	DA
14	10.13	E	14	9.13	E	14	8,13	E	14	7.13	DA	14	6,13	DA
15	11.0	E	15	10.0	E	15	9.0	E	15	8.0	E	15	7.0	DA
16	11.42	E	16	10.42	E	16	9.42	E	16	8.42	E	16	7.42	DA
17	1.2	M	17	12.2	M	17	11.2	E	17	10. 2	E	17	9. 2	E
18	1.19	M	18	12.19	M	18	11. 19	E	18	10.19	E	18	9,19	E
19	1.51	M	19	12.51	M	19	11.51	E	19	10.51	E	19	9.51	E
20	1.56	M	20	12.56	M	20	11.56	E	20	10. 56	E	20	9. 56	E
21	3:16	M	21	2,16	M	21	1.16	M	21	12,16	M	21	11.16	E
22	3:33	M	22	2.23	M	22	1.33	M	22	12.33	M	22	11.33	E
23	4.54	M	23	3.54	M	23	2.54	M	23	1,54	M	23	12.54	M
24	5.14	M	24	4,14	M	24	3,14	M	24	2.14	M	24	1.14	M
25	5, 41	M	25	4.41	M	25	3.41	M	25	1,41	M	25	3,41	M
26	3,19	MD	26	7.19	MD	26	6:19	MD	26	5. 19	MD	26	4,19	M
27	9,12	MD	27	8.12	MD	27	7.12	MD	27	6,12	MD	27	5.12	MD
28	9,48	MD	28	8.48	MD	28	7,48	MD	28	7,48	MD	28	5.48	MD
29	10,48	MD	29	9.48	MD	29	8,48	MD	29	7,48	MD	29	6.48	MD
30	11,47	MD	30	10,47	MD	30	9,47	MD	30	8,47	MD	30	7.47	MD
31	12,12	DA	31	11,22	MD	31	10. 12	MD	31	9,12	MD	31	8.12	MD
32	12.24	DA	32	11.24	MD	32	10,24	MD	32	9.24	MD	32	8.24	MD

A Table of the fixed Starres.

	Maie from the 15. to the last.			Iune from the first to the 15.			Iune from the 15. to the last.			Iuly from the first to the 15			Iuly from the 15. to the last		
1	8.20	MD	1	7.20	MD	1	6.20	MD	1	5.20	MD	1	4.20	M	
2	8.54	MD	2	7.54	MD	2	6.54	MD	2	5.54	MD	2	4.54	MD	
3	9.28	MD	3	8.28	MD	3	7.28	MD	3	6.28	MD	3	5.28	MD	
4	9.45	MD	4	8.45	MD	4	7.45	MD	4	6.45	MD	4	5 45	MD	
5	11.52	MD	5	10.52	MD	5	9 52	MD	5	8 52	MD	5	7.52	MD	
6	12.23	DA	6	11.23	MD	6	10.23	MD	6	9.23	MD	6	8.23	MD	
7	12.28	DA	7	11.28	MD	7	10.28	MD	7	9 28	MD	7	8.28	MD	
8	12.50	DA	8	11.50	MD	8	10.50	MD	8	9.50	MD	8	8.50	MD	
9	1.12	DA	9	12.12	DA	9	11 12	MD	9	10.12	MD	9	9.12	MD	
10	2.4	DA	10	1.4	DA	10	12.4	DA	10	11.4	MD	10	10.4	MD	
11	3.0	DA	11	2.0	DA	11	1.0	DA	11	12.0		11	11.0	MD	
12	3.4	DA	12	2.4	DA	12	1.4	DA	12	12.4	DA	12	11.4	MD	
13	5.12	DA	13	4.12	DA	13	3.12	DA	13	2.12	DA	13	1.12	DA	
14	5.13	DA	14	4.13	DA	14	3.13	DA	14	2.13	DA	14	1.13	DA	
15	6.0	DA	15	5.0	DA	15	4.0	DA	15	3.0	DA	15	2.0	DA	
16	6.42	DA	16	5.42	DA	16	4.42	DA	16	3.42	DA	16	2.42	DA	
17	8.2	DA	17	7.2	DA	17	6.2	DA	17	5 2	DA	17	4.2	DA	
18	8.19	DA	18	7.19	DA	18	6.19	DA	18	5.19	DA	18	4.19	DA	
19	8.51	DA	19	7.51	DA	19	6.51	DA	19	5.51	DA	19	4.51	DA	
20	8.56	DA	20	7.56	DA	20	6.56	DA	20	5.56	DA	20	4.56	DA	
21	10.16	E	21	9.16	DA	21	8.16	DA	21	7.16	DA	21	6.16	DA	
22	10.33	E	22	9.33	DA	22	8.33	DA	22	7.33	DA	22	6.33	DA	
23	11.54	E	23	19.54	E	23	9.54	DA	23	8.54	DA	23	7.54	DA	
24	12.14	M	24	11.14	E	24	10.14	E	24	9.14	DA	24	8.14	E	
25	12 41	M	25	21.41	E	25	10.41	E	25	9.41	E	25	8 41	E	
26	3.19	M	26	2.19	M	26	1.19	E	26	12.19	E	26	11.19	E	
27	4.12	MD	27	3.12	M	27	2.12	M	27	1.12	M	27	12.12	M	
28	4.48	MD	28	3.48	M	28	2.48	M	28	2.48	M	28	12 48	M	
29	5.48	MD	29	4.48	MD	29	3.48	M	29	2.48	M	29	1.48	M	
30	6.47	MD	30	5.41	MD	30	4.47	MD	30	3.47	M	30	2.47	M	
31	7.12	MD	31	6.12	MD	31	5.12	MD	31	4.12	MD	31	3.12	M	
32	7.24	MD	32	6.24	MD	32	5.24	MD	32	2.24	MD	32	3.24	M	

	August from the first to the 15.		August from the 15. to the last.		Septem from the first to the 15		Septem. from the 15. to the last.		Octob. from the first to the 15.	
1	3.20 ℳ	1	2,20 M	1	1.20 M	1	12.20 ℳ	1	11. 20 E	
2	3.54 ℳ	2	2.54 M	2	1.54 M	2	12 54 ℳ	2	11.,54 E	
3	4.28 ℳ	3	3,28 M	3	2,28 M	3	1. 28 ℳ	3	12.28 M	
4	3.45 *MD*	4	3.45 M	4	2,45 M	4	1. 45 ℳ	4	12, 45 M	
5	6.52 *MD*	5	5.52 MD	5	4,52 M	5	3,82 *M*	5	2, 52 M	
6	7,23 *MD*	6	6.23 MD	6	5.23 M	6	4.23 *M*	6	3,23 M	
7	7:28 *MD*	7	6.28 MD	7	5,21 M	7	4,28 *M*	7	3, 28 M	
8	7,50 *MD*	8	6.50 MD	8	5.50 MD	8	4;50 *M*	8	3, 50 M	
9	8,12 *MD*	9	7,12 MD	9	6.12 MD	9	5.12 *M*	9	4. 12 M	
10	9.4 *MD*	10	8. 4 MD	10	7.4 MD	10	6,4 *MD*	10	5. 4 M	
11	10.0 *MD*	11	8.0 MD	11	8.0 MD	11	7,0 *MD*	1	5. 0 M	
12	10.4 *MD*	12	9.4 MD	12	8.4 MD	12	7,4 *MD*	12	5, 4 M	
13	12.12 DA	13	11.12 MD	13	10.12 MD	13	9.12 *MD*	13	8,12 *MD*	
14	12.13 DA	14	11.13 MD	14	10,13 MD	14	9.13 *MD*	14	8, 13 *MD*	
15	1.0 DA	15	12.0	15	11.0 MD	15	10,0 *MD*	15	9. 0 *MD*	
16	1. 42 DA	16	12.42 DA	16	11.42 MD	16	10.42 MD	16	9. 42 *MD*	
17	2. 3 DA	17	2. 2 DA	17	1. 2 DA	17	12 2 *DA*	17	11.2 *MD*	
18	3.19. DA	18	2,19 DA	18	1. 19 DA	18	12. 19 *DA*	18	11,19 MD	
19	3,51 DA	19	2,51 DA	19	1. 51 DA	19	12:51 *DA*	19	11.51 MD	
20	3,56 DA	20	2,56 DA	20	1, 56 DA	20	12.56 *DA*	20	11.56 MD	
21	5.16 *DA*	21	4. 16 DA	21	3.16 DA	21	2.16 *DA*	21	1. 16 DA	
22	5,33 DA	22	4. 33 DA	22	3,33 DA	22	2.33 *DA*	22	1,33 DA	
23	6. 54 DA	23	5,54 DA	23	4. 54 DA	23	3.54 *DA*	23	2: 54 DA	
24	7. 14 DA	24	6. 14 DA	24	5, 14 DA	24	4.14 *DA*	24	3. 14 DA	
25	7.41 DA	25	6.41 DA	25	5. 41 DA	25	4.41 *DA*	25	3. 41 DA	
26	12. 19 E	26	9.19 E	26	8,19 E	26	7,19 E	26	6.19 E	
27	11,12 E	27	10,12 E	27	9. 12 E	27	8.12 E	27	7.12 E	
28	11.48 E	28	10.48 E	28	9,48 E	28	8.48 E	28	7.48 E	
29	10.48 M	29	11.48 E	29	10.48 E	29	9,48 E	29	8.48 E	
30	1. 47 M	30	12.47 E	30	11.47 M	30	10,47 E	30	9. 47 E	
31	2. 12 M	31	1.12 M	31	12. 12 M	31	11.12 E	31	10.12 E	
32	2. 24 M	32	1,24 M	32	12,24 M	32	11.24 E	32	10.24 E	

	Octob. from the 15. to the last.		Novem from the first to the 15		Novem. from the 15. to the last.		Decem. from the first to the 15.		Decem. from the 15 to the last.	
1	10. 20	E	9,20	E	8.20	E	7,20	E	6.20	E
2	14. 54	E	9,54	E	8.54	E	7.54	E	6.54	E
3	11.28	E	10,28	E	9,28	E	8,28	E	7.28	E
4	11,45	E	10,45	E	9,45	E	8.45	E	7.45	E
5	1,52	M	12,52	M	11,52	E	10,52	E	9.52	E
6	2,23	M	1.23	M	12.23	M	11,23	E	10,23	E
7	2,28	M	1,28	M	12 28	M	11,28	E	10,28	E
8	2,50	M	1;50	M	12.50	M	11,50	E	10,50	E
9	3.12	M	2.12	M	1.12	M	12,12	M	11,12	E
10	4. 4	M	3,4	M	2.4	M	1,4	M	12,4	M
11	5. 0	M	4 0	M	3.0	M	2,0	M	1,0	M
12	5, 4	M	4,4	M	3.4	M	2,4	M	1,4	M
13	7,12	MD	6.12	M	5.12	M	4,12	M	2,12	M
14	7,13	MD	6.13	M	5,13	M	4,13	M	2,13	M
15	8.0	MD	7,0	M	6.0	M	4,0	M	4, 0	M
16	8.42	MD	7.42	MD	6.42	M	5.42	M	4,42	M
17	10.2	MD	9.3	MD	8.2	MD	7,2	M	6,2	M
18	10,19	MD	9.19	MD	8.19	MD	7,19	M	6,19	M
19	10.51	MD	9.51	MD	8.51	MD	7.52	MD	6,51	M
20	10.56	MD	9.56	MD	8, 56	MD	7,56	MD	6,56	M
21	12.16	DA	11.16	MD	10.16	MD	9.16	MD	8.16	MD
22	12,33	DA	11.33	MD	10,33	MD	9.33	MD	8.33	MD
23	1:54	DA	12.54	DA	11.54	MD	10.54	MD	9,54	MD
24	2. 14	DA	1.14	DA	12, 14	DA	11,14	MD	10,14	MD
25	2. 41	DA	1.41	DA	12.41	DA	11,41	MD	10,41	MD
26	5.19	DA	4 19	DA	3,19	DA	2, 19	DA	1.19	DA
27	6.12	E	5.12	E	4. 12	E	3.12	DA	2.12	DA
28	6.48	E	5 48	E	4,48	E	3.48	DA	2.48	DA
29	7.48	E	6,48	E	5.48	E	4.48	E	3,48	DA
30	8.47	E	7,47	E	6.47	E	5.47	E	4. 47	E
31	9.12	E	8.12	E	7.12	E	6.12	E	5. 12	E
32	9.24	E	8.24	E	7,24	E	6,24	E	5. 24	E

NOw this table serueth for euery moneth in the yeare (being exactly calculated) the time of their being south or touching your meridian (or as some terme it) Noone-stead; serving very well the Sea men to take the height of them with their instruments vpon the Sea, referring it vnto the Table of Declination that goeth before: the first is the houres, the second minutes, the third be the letters that shew you whether they be south by day or by night, in the euening or morning, in the forenoone or afternoone: of which the letter E doth signifie Euening, the letter M signifieth Morning, the letters D M signifieth day in the morning, and the letters DA signifieth day in the afternoone (as I said before) the very houre and minute of their being South. Now you see that I haue put to their being South in the day, as well as in the night, to the intent to know the houre of the night as well by their setting, as also by your Compasse, which I shewed you in the first chapter or rule, namely, to bring your 32. points, into 24. houres: and in like manner, in the fourth Chapter by shining of the Moone to diuide the shining into equall parts; then those parts being equally diuided with the houre and minutes, the time of their shining before their being south, sheweth the iust rising of the stars, and the other time of their shining after their being South sheweth their setting (as I haue declared in the rule of the shining of the Moone.) Now (saing the Table runneth from the first day of euery moneth to the fiftenth: from the fiftenth to the last day,) if you will know the exact time betweene the first day or the fiftenth day, and betwirt the fiftenth day and the last, doe this; take how many daies of the moneth is past either from the first day or 15 day, and pull so many times foure minutes from that number as there are dayes past, either from the first or fiftenth day, the remainder will shew you the true time of their being South. That knowne, you shall doe (as is aforesaid) for their rising and setting.

The signification of the letters in the Table.

The 21 Chapter sheweth you the making of a generall instrument, to know the houre of the day by, throughout all the world.

NOw for the making of your Instruments for the Sea, with their vses, you shall repaire to the booke of Nauigation made by Martin Curtise a Spaniard, imprinted by maister Iugge, late printer to the Quenes maiestie: else I should haue shewed you the making of diuers instruments, as also the making of the Equinoctiall Diall with his vse, which is very profitable to know the houre of the day by, in all latitudes through the whole world, for your compasse is not to know the houre of the day by the sunne, neither in the morning nor euening, neither can you know when the Moone is East or West, she hauing north declination, as being in the signe of Taurus, Gemini, Cancer or Leo, because your Compasse standeth flat as doth your horizon. Wherefore it is very good for sea men to vse the equinoctiall dialls, for that it sheweth them the true houre of the day in all latitudes, and also the Moone doth giue a true shadow in that Diall in all Latitudes, for I doe know that Sea-men are very many times deceiued, where it doth flow an East and West Moone, or any point betweene the Southeast and Northeast. Because in setting the Moone with their Compasse (being in the North signes,) she seemeth to be East by the Compasse, when she is neere the East Southeast in her course: and in like manner when the Moone seemeth west by the Compasse, she shall be a little more than west South-west in her course: which is a very perilous matter to them that should put into a tide, harborow, or hauen, where he knoweth there is water enough for him, if he doe come at a full sea, and then by the error of the Moons shadow vpon the Compasse he is deceiued: and when he findeth the error, he thinketh that the cause thereof cometh by the occasion of some storme of wind that is like to follow, imputing it thereto, that the tide doth not keepe his course, whereas the very cause

The Sun and Moone doe giue a full shadow by the compasse.

The Equinoctiall diall giueth a true shadow all the world over.

A perillous matter.

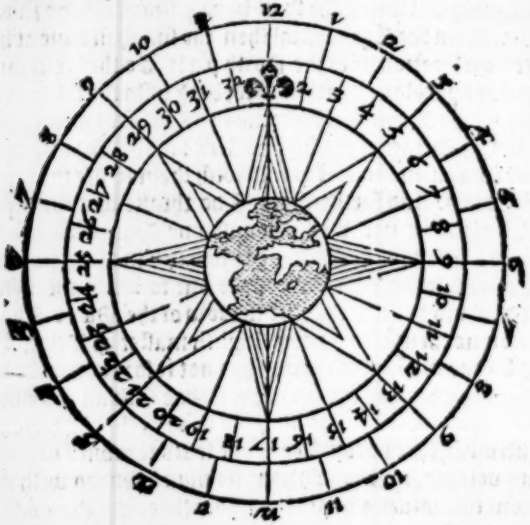
cauſe groweth by no other meanes then by reſerring a falſe ſhadow by the Horizontal cõpaſſe: which falleth out, eſpecially if the moone be neare her greateſt declination, vnto the North parts, that is in the ſignes of Gemini and Cancer. And alſo the effect is moſt perceiued if the dragons head bee in the beginning of the ſigne of Aries: for then if the Moone bee in the begining of Cancer, ſhe ſhall haue 5. degrees more in declination from the Equinoctial then the ſun ſhall haue at his greateſt declination vnto the North parts. So that reſerring the Moones paralax (which is according vnto the latitude of any place) the Moone ſhal be declined 28. degrées and a halfe vnto the north part of the Equinoctiall: ſo that for auoiding of theſe inconueniences, I would wiſh them to vſe the Equinoctiall dials. And furthermore, I do thinke that the Equinoctiall dials bee not vſed amongſt our Mariners here in England, for that the Charges is ſo much in the making of them, & yet it ſerueth no other turne but to know the houre of the day, and to ſhew the true ſhadow of the Moone. I haue not knowne them vſed by any Engliſh maſter or Pilot, but onely by one man, which perſon had not it for the proper vſe therof, but rather had it to ſay, that he had ſuch an inſtrumẽt as no Engliſh man had the like, and to brag that he had ſuch an inſtrumẽt, that he could do great feats therwith in going of long voiages, &c. I would haue no man offended with me. I know the naturẽ & qualitie of ſome that take charge, they will haue inſtruments and other things thereunto appertaining, and yet they themſelues do not know the vſe of them, yet the will ſeeme to be cunning, and that they need no inſtructions of any man, for that they know all things, and yet in effect know nothing. (But notwithſtanding) I would wiſh them that be ſeaferring men, to vſe them ſelues to the Equinoctial dials, for that they do ſerue two notable turnes, as wel at home in theſe our chãnels, as alſo in long voyages they make them with a very eaſie charge: for wheras in the Art of Nauigation it is ſhewed how to make them in braſſe, they make them with wood in this maner, take a peece of boords

The Moone may decline 28 degrees and a halfe from the Equinoctiall.

Of men that will haue inſtruments, and know not the vſe of them.

An eaſie way to make an Equinoctiall dial with little charge.

boords end of sixe inches broad more or lesse at your discretion, and halfe an inch in thicknesse, then hauing cut it round and plained it smooth, you may either graue it in the 32. points of the Compasse, or else paint them vpon it, with some colors, with the 24. houres, vpon both the sides as this figure sheweth.



That done, take a wyer of iust the diameter of the Instrument, then put it through the middle or Center of the Instrument, then make it fast, that the one end be halfe way through on the one side, and the other halfe on the other side: this done, make a frame with three peeces of boords end, to hang the Diall or instrument vpon, with one pin on the Gast point, and another on the west point: then take another peece of boords end being square, and with a paire of Compasses strike a quarter of a circle, of iust the bignesse of the quarter of the Diall, and cut all that away, and then the rest

of

of the ſquare that is left (at the edge of the quarter of the cir-cle) diuide into 90. equall parts, marking it thus, 10.20.30.40.50.60.70.80.90,

As in this forme: laſt of all let this be placed in the middle of the frame, ſo that 90 may ſtand right vnder the very middle of the Diall, and there made faſt, in ſuch forme, that the very end of the wyer when the Diall is put vp and downe may touch the hollow part that you ſee cut away, which is called the Directer, and ſo it is finiſhed, and will ſtand altogether in this forme.

The Equinoctiall line.

The vſe of this Diall is moſt neceſſary in a Shippe, for that you haue occaſions to tranſport your ſelues into all the climates. And to know the true houre of the day, doe this: Set this Diall by your Compaſſe, (the directer vnto the Southwards) and then (you knowing how high the Pole is aboue the Horizon) ſet the end of the wyer right againſt that degrée, in the directer, and the other end of the wier will point iuſt vnto the Pole, then loke what ſhadow ỳ wier doth giue

by

by the Sunne, which is the true houre of the day. In like manner you may know the true houre of the night by the Mones shadow, and also the Mone wil giue a true shadow of her place.

The 22. Chapter treateth of the soundings, comming from any place out of the Occident Sea, to seeke Vshant or the Lyzard, and so all alongst till you come to the coast of Flanders: with other necessary matters to be knowne to them that be Channellers that doe occupie or deale among sands, bankes, or such other like.

BEcause it is necessary to be had in memorie, for that it is a dangerous place to hit or fall with, to enter into the sleeue comming homewards out of Spaine or Portugall, or from Barbarie, or any other place from the Southwards, a Ship that commeth from any such place to seeke the Isle of Vshant, or the Lyzard, in this wyse of sounding of a 100. or ninetie fadames shall find big soundings, and shall be neere about to the seames. In the wyse of eightie fadames you shal find cockle shels and dents in the tallow of the lead: and in this sounding holde on your course to the North, till you change sounding, then if you be at 60 or 64 fadame, you shall find small sand and Mathey ground, and shall bee neere the coast of Vshant. If you haue time and day, goe seeke it in the Northeast, & you shall be about 10 leagues frō ẏ Isle. If you come making your course about Base freed, you shall finde course sand, red & browne, & you shal haue sounding at 40 fadame: if you be towarde the hauke of Silley, you shall haue soundings, at 86 or 90. fadame, and you shall finde in the tallow stonie ground, and shall be well shot towards the banke of Silley. When you be at eightie fadame, you shall find small black sand, and shal bee well towards the Lyzard. When you be at 56 or 64. fadame, you shall find white sand and white soft wormes, and shall be very nigh to the Lizard. Betweene the Cape of Cornewall and Vshant unto the

The Sounding neere unto Vshant and Lizord.

the Channell you shall find 17. fadame and nere enough. Betweene Dodmon and the Fozne, in the Channel you shal haue 40.0250. fadame. If you be thwart of Plimmouth oz the Start, you shall find streamy ground & dents in the tallow and soundings 41.02 42. fadams At the comming from Poztland you shall haue 35. fadams, and smal shingles. And when you be nigh to Poztland 30. fadams, and stones like beanes and this sounding will last till Saint Aldam, and in the said sounding you shall find white stones like broken Rules, and other that be bigger, and then you shal be thwart of Saint Aldam oz of the Ile of Wight.

The sounding in the Chanell.

Two oz three leagues from the Ile of wight, you shall find 25. fadame, with dents and clefts in the tallow like smal threads, two oz three leagues from the Casks, you shall find 40 fadame, and bigge stones ragged and blacke Betweene the Ile of wight and the Hag, the deepest is but 35. oz 40. fadame Betweene the Ile of Wight and Lantargate, the deepest is but 25. oz 30. fadame. Betweene Beachy and the Ile of wight a league from the land, you shall find 38. fadame, and Poppel as bigge as Beanes. Betweene Fairely and the water of Summe in the deepest, but 25. fadame. Betweene Folstone and Bolaene, is a banke that is called rippe rappe, and lieth in the mid way between Picardie and England, and hard a bozd by it, is 26.0227. fadam. In the straight of Callyce is 30. fadame, in the Rode of Callyce is 16. fadame. And alongst the coast of Flanders is but 23. fadam, the deepest. Thus much haue I said foz ỹ entrãce of the Sleene, to come to the Riuer of Thames, and in the entrance in the midway betweene Ushant and Lizard, the Pole Artick eleuated 50. degrees and a halfe, and the Equinoctiall is lifted aboue the Hozizon 39. degrees and a halfe. And Furthermoze, foz them that are Channellers and occupiers amongst sands and bankes, & such other like, they must haue conuocation of these things following. As this: first if you know how the Channell doth lie right betweene any two sands: you must view the land to take some marks

The height of the Pole at the entrance of the Sleeue.

Necessary things to be noted for them that are Channellers & dealers amongst sands.

of

of it, to be a leading marke. And that shall you do thus: loke some thing that standeth farr into the land, that you may know it well, being right open with the Channell of the sands, then take another marke neere vnto the waters side, and the one to be right against the other, when that you bee in the middle of the Channell: And then you knowing these two markes well they will be leading markes vnto you for euer to keepe that Channell.

And then furthermore, if it doth so happen that the Channell doth turne to keepe another course, or else (some other danger lying in that way) you must haue a thwart marke, to know both when that you are cleere of any danger, and also when that you are open of another Channell, and that you shal do as before is declared, to take some marke within the land, & also another neere vnto the sea, water, or riuers side to be your thwart marke when you bring them both together. And this is most specially to be noted: that these marks be very yare, and good when the one is far distant from the other: and those marks very slow, and asketh some distance in sailing to open and shut them which are neere together vpon the land. And furthermore, for them that are Channellers or occupiers amongst sands, for that the weather is not alwaies Cleere, when they haue occasion to passe through such places, it is good for them to sound the Channels perfectly, and to know by the depth, what side of the Channell they are vpon, and also how farre they are shut into that Channell. And also in like manner to know by the sounding of any of the sides of the Channell, whether they be neere any of the sands or dangers, or any breach off: for that some sands or dangers there be, hauing faire or good soundings or shaldings, that they may borrow off and on their pleasure. There be againe some sands or dangers, that there is no borrowing or sounding of them, and these be neall or deepe hard vnto the sands or dangers: for that the water is deepe hard vnto the sand: and these are verie dangerous sands for any Shipp to come neere, for that they shall haue

the

the water verie deepe, and by and by be aground. Yet furthermore, it is verie good for them that be Channellers and occupiers amongst ſands, to know which way the tide doth ſet at euery time of the tide: for that many times it happeneth ſo, that when the ſands be vnder the water, the tide doth ſet croſſe the Channell, which is a dangerous matter if it be not verie well conſidered by the Maſter or Pilot, &c.

The twenty three Chapter is as touching the Variation of the Compaſſe, called the Northeaſting and the Northweſting of the Compaſſe: and how to giue a gueſſe to know the Longitude.

AS touching the variation of the compaſſe, called the Northeaſting, or Northweſting, it is ſuppoſed that ỹ compaſſe doth vary by proportion, in the ſailing to the Eaſtwards or weſtwards: if it varieth by proportion, that the north point is varied one point from the North, at 22. degrees and a halfe, and ſo vntill the North point doth ſtand Northeaſt or Northweſt: and that is, when you are 90. degrees from the Meridian that ỹ compaſſe was made at, to the Eaſtwards or Weſtwards. Some alſo are of another opinion, that the compaſſe doth vary by no proportion, but doth vary according vnto the nature of ſome kind of Minerals that is in ſome country or ſome kinde of Ilands that draw the compaſſe by the mines of the Loadeſtone or Magnes ſtone, that they touch their compaſſe with, when they make them. And furthermore, the booke of Martin Curtiſe, called the Art of Nauigation, ſaith, that the compaſſe doth vary by proportion in this manner: which is by the proportion of a Circle, for that the North point doth alwaies point vnto a place in the heauens that is vnmoueable, and

Of the Compaſſe to vary to euen proportion.

Of the Compaſſe to vary by no proportion.

Of the Compaſſe to vary according vnto the proportion of a circle that is ſwiftly, and ſlowly.

and therfore as you do transport your selfe to the Eastward or westward, ỳ North point doth still point vnto that place in the heauen: wherefore (as he saith) when you be 90. degrees in Longitude from the place that the Compasse doth stand due South and North, that is, when you be one quarter of the circumference of the earth, in that Parallel the Compasse will be varied foure points from the North: and as you doe trãsport your self further, then the North point of the compasse wil come nerer & nerer into the North and whẽ you are iust half the circumference of the earth, that then the North point will stand due North vpon the Pole again, for that you are come to the same Meridian again vpon the opposite part of the earth (as it doth appeare in the third part, and fifth Chapter of the said booke of Martin Curtise:) but if that be true, then the compasse doth vary swiftly at the first, and slowly afterwards, in order like vnto the Sunnes declination: by which they may very well know by what order the Compasse doth vary, and so by the variatiõ you may giue a nerre estimation of the Longitude, and know in how many degrees the Compasse is varied one point, two points, three points, or four points, which is the greatest variation, Now to know the proportion, doe this: First make a circle with a paire of Compasses, and strike a line by the Center to the circumference, which shall be your Meridian line, then stricke another line by the Center a crosse, that you may diuide the cercle into foure equall parts, and then because 45. degrees is the greatest variation, set 45 vnto the East part and West part, diuiding euery one of the quarters of the circle into 45 equall parts, according to the greatest variation: then make another circle of ỳ Diameter, that the circumference touch that center of the circle, and diuide it as you diuided the Compasse, after the rate of 32. points, although you need not to diuide but that side to the Northwards, and then the Northeast & Northwest point will fall vpon 45. degrees: that done, draw lines according to the points of the compasse vnto the Eastwards or westwards, and loke how they

To know in how many degrees going vnto the Eastward or Westward, that the compasse doth vary one point two points, or three points, &c.

they fall vpon the line that commeth from the Center of the other circle: of which euery quarter is diuided into 45 equal parts, and then (at the very place that the line doth touch) drawe Parallel lines in ỹ circle by proportion at euery place to the Eastwards or Westwards, that the line of the compasse falleth vpon: and that will shew you iustly how many degrées you shall transport your self vnto the Eastwards or Westwards for the varying of the first point, second point, and third point: and in like manner the greatest variation which is the fourth point. So that (according to that order) it will fall out in this manner, that the compasse will be varied one point at neere eleuen and ½. It will be varied two points nære about 14. degrées and a halfe.

To know how many degrees are in the varying of one point.

It will be varied thræ points at 42. degrées and about a halfe. But it will not be varied the fourth point vntil you be 90 degrées frõ the Meridian that the compas was made at: which is a very slow varying being 47. degrées & ½ before the compasse doth vary one point, & betwæn the third point & the second point being 18. degrées for the varying of that point, and then from the second point vnto the first point is 13 degrées and better, and last of al from the varying of one point to the Meridian it is eleauen degrées & ½ part, euery degræ being according to that parallel you are in, which doth alter according vnto your Latitude from the equinoctiall, for vnder the Equinoctiall it is 60 English miles, or 20. English leagues vnto one degræ. In the Latitude of 60. degrees from ỹ Equinoctiall, there in that parallel it is but 30. miles or 10 English leagues vnto one degræ, &c. As it is plainely shewed in the 16. chapter of this book, wherein is an instrument shewing you how many miles of Longitude will answere vnto a degræ in euery seuerall Latitude by the applying of a thread at your discretion: So that I conclude, if the compasse doth vary by that order of proportion that Martin Curtise doth attribute vnto it, you may giue a nære guesse to finde the Longitude by the varying of the compasse, being neere vnto the Meridian in which the compasse doth stand

If you will know how many leagues a degree is, repaire to the 16 Chapter.

due South and North: but if you be verie far from the Meridian that the compasse was made for, then the variation is so slow, that you can haue no iudgment at all (by the variation of the compasse to find any Longitude.

There may grow some error in the proportion of the varying of the Compasses.

And furthermore if the compasse doth vary by that proportion that Martin Curtise doth affirme, I am of this opinion, that there may grow som error in proportion in those compasses that are made for any Meridian: for those compasses that are made here with vs in England, whereof the needle doth stand fiue or sixe degrées vnto the Eastwards of the North, (as doth appeare by all the needles made for Dials, & also of the compasses) if they would haue the North point to stand due North, then the end of the wyers vnder the Card of the compasse should staud fiue or sixe degrées vnto the Eastwards of the Flouredeluce: wherefore it may bee doubted, that the compasse may vary more the one way then it will the other way, by that proportion that the end of the wyer doth stand from the North Point. For (if in the greatest variation) the end of the wyer (vnder the Card of the Compasse) doth stand Northwest, the Flouredeluce of the Compasse should stand nær halfe a point to the Westward of the Northwest.

And in like manner at the greatest variation, if the end of the wyer doth stand Northeast, then the Flourdeluce should stand nær halfe a point vnto the Northwards of the Northeast &c. Wherefore the Compasses that were deuised by Norman, are very good to reforme those causes. But this cause is very speciall to giue a nær gueese of the Longitude, that is to say, the Compasse will vary more quickly (according to the order before written) by which you sée they may transport themselues further into the Eastwards or Westwards, before that the Compasse doth vary one point, then it doth for the other three points, so that they are not able to giue any estimation at all, by the varying of the compasse to know any Longitude: for that they may trauaile more then the quarter of the circumference of the earth, before the com-

Of slow varying of the Compasse.

passe

paſſe will be varied one point backwards and forwards.

And furthermore, it is very good for them that are Maſters or Pilots of Ships to note, when they do fall with any land where the compaſſe is varied, to make a remembrance in a booke, how many points and degrees the Compaſſe is varied in euery place where they came vnto, which will be a great helpe for them to find that place againe. And to find the variation, it is declared in the firſt Chapter.

An Hidrographicall diſcourſe to ſhew the paſſage vnto Cattay fiue manner of waies, two of them known, and the other three ſuppoſed; wherein you ſhall know the diſtance of Cattay, and alſo by what points or winds of the compaſſe that you ſhall ſaile for the attaining thither, and alſo the reſt of the Eaſt Indies.

WHereas it hath beene oftentimes in queſtion of late yeeres now in this our age, for the diſcouery for to finde out a way for to come vnto Cattay, Chinai and the Ilands of Moluccas; with other places in the Eaſt Indies: I haue thought it good to write this Hydrographicall diſcourſe, to goe to Cattay 5. manner of waies, for that there are ſome people that are doubtfull whether that there be any ſuch place, other ſome are doubtfull that there is no paſſage thither.

So ſome holding one opinion, and ſome another, I haue taken vpon me for to ſhew vnto them the paſſage to goe vnto Cattay fiue manner of waies, whereof two of them are known, and the other three ſuppoſed.

Wherein I haue ſet downe particularly the courſes, that is to ſay, by what point of the Compaſſe that you muſt ſaile, and all the diſtance what number of leagues that it is from place to place, hauing peruſed the beſt Coſmographers, and for that wee haue no Charts, Plats Hydrographicall,

that doth shew the true courses & distance, it is possible that is not exactly true. but onely to glance somwhat nere the matter: Therefore you must not loke to haue it so certaine that there is no error in it, neither am I assured that it is not altogether vntrue, either in the distance or courses, but that you haue some aide by this, &c.

To goe vnto Cattay that way that the Portugals doe goe vnto Calicut and the Ilands of Moluccas which is about by Cape bone Sperance, after that thou art departed from the Lizard or Cape of Cornewall, being the Westerne part of England, you must make your direction from thence vnto ỹ Canary Ilands, hauing Latitude twenty eight and a halfe, the course is neer the South Southwest about 500 leagues.

And on the starreboord side is the West Ocean sea, and on the Larboord side, first the coast of Fraunce, then the coast of Spayne and Portugall, and then the coast of Barbary in Africa &c.

From the Canary Ilands you must set your course vnto Cape de verde in Ginney, the Latitude thereof is nere 15. degrées, and the Course is South about 270. leagues, and on the starboord side is the West Ocean Sea, and on the Larboord side the coast of Barbary and Ginney. From Cape de verde, you must goe vnto Cape Palmas, the Latitude is nere foure degrées, and the course is South and by East, about 130. leagues, on the Starboord side is an Ocean sea and the Larboord side the coast Ginney. And from thence make your derection to Cape bone Sperance, being the Southermost part of all Aethiopia, forsaking the coast, & making your course through the sea, the course is nere the South-east & by South, 1060. leagues, and the Altitude of the Antartick pole is about 35 degrées aboue the Horizon and on the Starboord side is Brasile in America, and the great Riuer of Platte, and on the Larboord side is the coast of Castill de Mine, in Ginney and Binney, and the coast of Aethiopia, &c. But if that you will keepe the coast of Ginney, then being departed from Cape Palmas, goe vnto the Iland of

Saint

Saint Thomas your course is East and by South, nere fiue hundred sirty leagues, and the Iland of of S. Thomas hath no Latitude, for that it is directly vnder the Equinoctiall, and on the starboord side is the Ocean Sea, and on the Larboord side is the coast of Gastel de Mine, and the coast of Binney. &c.

And from the Iland of Saint Thomas, vnto Cape bone Sperance, the course is South and by East, about seuen hundred fifty leagues, and on the starboord side is the Ocean sea, and on the Larboord side the coast of AEthiopia; from Cape bone Sperance, you must set saile vnto the great Iland of S. Laurence, namely to the Westermost part of the Iland, and that hath latitude toward the Antarcticke Pole, aboue 28 degrees, and the course is from Cape Bone Sperance, Northeast and by east, about 550. leagues, on the starboord side, is the vnknown land that lieth towards the Antarctick pole, and on the larboord side of the coast of Ethiopia, and the length of the Iland is about 360. or 400. leagues, and the longest way of the Iland doth lye East Northeast, & West Southwest, and is from the maine land of AEthiopia about eighty or 100 leagues, &c. Furthermore by the way, I doe thinke it good for to shew the course and distance vnto the red sea, and also the course and distance vnto Calicut. To set out your course from the Easternmost end of the great Iland of S. Laurence, which hath the Antarcticke Pole raised 13. degrees, towards the straights of the red sea, the course is North and by East about 470. leagues, and the latitude of the straights, is about 10 degrees, towards the North pole, and this straight is greatly occupied, for that all the spices that serueth the Turkes dominions, and also some parts of Christendome, is brought from the Iland of Moluccas and other parts of the East Indies, as Calicut, and such like places, and so by shipping transported into the red sea, & so put on land in Egipt and carted ouer a little part of the land, and then the are newly embarked, and brought downe to the great River Nilus, and put aland at Alexandria in

Egypt, that is a Port, in the midland sea, and from thence they are transported by shipping vnto a number of places both in the Turkes dominions & other places Christned, &c.

From the straights vnto the hither end of the red Sea in Egypt, the course is for the most part Northwest and North Northwest, about neere 500. leagues. and going into the red sea, the starboord side is the coast of Arabia, and the Larboord side is the first coast of Aethiopia, and then the coast of Egypt, &c.

And also if that you will goe from the East end of the great Iland of Saint Laurence, vnto the famous merchant towne called Calicut in Indie, then your course is Northeast and to the Eastwards about 860. leagues, and the Latitude is fiue degrees to the North parts and on the starboord side is the ocean sea, and on the Larboord side is the coast of Aethiopia, and the straights of the red sea, and the coast of Arabia, and the straights of the Persian sea, and the Iland of Ormes, &c. But if that you will hold on your course to goe vnto Cattay, then from the East end of the great Iland of Saint Laurence, to the great Iland called Traprobane, your course is East Northeast, or east & by North about 1100 leagues: but it is possible, that in these courses, you may meete with a number of Ilands, for that all this East Ocean sea is very full of great and small Ilands, and the middle of this great Iland lyeth directly vnder the Equinoctiall, and the length of this Iland is neer 500 leagues, and on the starboord side is the vnknowen lands, towards the Antarctick Pole, and on the Larboord side the straights of the redde Sea, Arabia, the Iland of Ormes, the Persian sea, Calicut, and the great riuer of Ganges. And now for to depart from the great Iland of Traprobrane, to goe vnto the great Iland of Gilolo, being the greatest Iland amongst all the Moluccas, the course is East about one thousand leagues, but there lyeth a number of Ilands in the way, and on the starboord side is the Iland of Java and Borneo, and on the Larboord side the greatest heape of the Moluccas Ilands. The Iland of Gilolo

hath

hath no Latitude, for that it lyeth directly vnder the Equinoctiall, from the Iland of Gilolo vnto the coast of China, the course is North and by West, about 500. leagues.

The Latitude of China is about 25. degrees, and on the starboord side is the south sea, and America, and the larboord side is the Ilands of Moluccas: but for to goe from the great Iland of Taprobane, the nert way to China, the course is North-east and by East 1000. leagues, and then on the starboord side, you shall haue al the Moluccas Ilands, and on the larboord side the main land of Asia or East India; and then from the Coast of China, vnto the great Bay of Quinsay in Cattay, the course is North and by East about 100. leagues, and the entrance of the Bay of Quinsay, the Latitude is 35. degrees, and on the starboord side is the firme land of America and the great Iland of Iapan, and the Larboord side the coast of China and Cattay, &c.

Now thus much haue I said as touching the way to come out of England to goe vnto Cattay and East India, hoping that the reasonable Reader will not enuy me, for this vsing my discourse, neither you must not looke so erquisitly vnto it, for that it cannot be the exact truth: for as I doe suppose that no English man hath seen any true Chart or Plat of all the East India, wherefore I doe suppose that you will beare with this my discourse, &c.

And now furthermore as touching this discourse for to come out of England to goe vnto Cattay, the second way, and that is known that the Sea will let them haue passage, that is to say, through the straights of Magallane, and so into the South sea, as thus, first to make their direction from the West part of England vnto the straights of Magellane: although that indeed there can bee no longer passage by Sea. but that the ships are to seeke som places for to water at at, and other easements, yet notwithstanding I do meane to make but one direction for course from England vnto the straights of Magellane, for that the Master or ỳ Pilots may seeke their watring places most best for their purposes, &c.

From the Lizard vnto the straights of Magellane the course is for the most part South southwest and to the westwards, about 2400. leagues, and the Latitude of the straights is 52. degrees and a halfe towards the Antarctick Pole, and on the starboord side is the firme land of America, and the Larboord side Europe and Africa,&c.

And through the straights, the course may be West or West Southwest 100. or 140 leagues before that they be clerely in the South sea; and now being into that sea, they may goe either into Cattay or the Moluccas, or the Port of Pannama, that is the place where the king of Spaine hath all the treasure that commeth from Peru. And from thence it is carried vp a certaine riuer, and transported ouer the necke a land, and then imbarked and brought downe another Riuer, and so landed at Nombre di dios, and from thence transported by ships into Spaine, &c.

Being through the straights of Magellane, if that you will goe into the Port of Pannama, then your course is for to goe North northwest, or northwest and by North, or North and by West, as the land will giue them passage, for that there hath not bin made any true Plats for that coast in that sea, and doth containe in leagues frō the straights vnto the port of Pannama, 1100. or 1200. leagues. But if that you will go from the straights vnto Cattay, as it is a sea that is not vnto the South parts nere the straights well knowen, so there may ly many Ilands in that Sea that you may meete with, and also there may be rocks and danger there in like manner that are not knowne, but the generall course is Northwest vnto Cattay or China, about 2800. leagues, hauing on the starboord side the maine land of America, and on the Larboord side the vnknowne land that lieth towards the Antarctick Pole, and also the Ilands of Moluccas and Calicut, and thus much haue I saide as touching the passage vnto Cattay, by these two wayes that are knowne But here is one thing to bee noted, for (as it hath bin reported) the Portugalls Carickes going vnto Calicut, when

that

that they be at Cape bone ſperance, then they do not directly ſet their courſe the next way, but ſtand South ouer towards the land that lyeth to the Antarctick Polewards, and the cauſe thereof is the great Current, that is at Cape bone Sperance, continually running from the Eaſt into the Weſt, and when that they haue gone a hundred or a hundred and fifty leagues vnto the ſouthwards of the Cape, then they ſet their courſe for to go with Calicut, ſo that outwards they do not com nere the great Iland of Saint Laurence, but goe a great deale to the ſouthward of it, for that the will not be let by the great currant: But when they doe come homewards, then the doe come hard by the Ile of S Laurence, and ſo directly with Cape bone ſperance, for that they will haue all the help that they may with the Currant, then they goe weſt Northweſt into the ſea with the maine land of America, till that they be halfe that ſea ouer, and then they do ſet their courſe to goe homewards, as it is not vnknowne, that when the Spaniſh Fleete doth goe outwards to the Weſt Indies, they do go to the Canaries, and ſo weſt into the ſea and ſo hold in by the ſouth land of the Bay of Mexico, for that they haue ſome help by the Current: but when that they do come home, then they do come by the northland of the Bay of Mexico, betweene the Iland Cuba and Terra Florida, for that they wil haue the Current homewards to help them. Alſo it is reported that in the ſtraights of Magalane that the Current runneth continually from the Eaſt into the Weſt. Now thus much haue I ſaid, as touching the two wayes vnto Cattay, for that it is knowne that there is paſſage by Sea, if that it were attempted, although the paſſage is very long, &c.

The third way, that is not knowne, but ſuppoſed that it may be paſſageable, is by the Northweſt, the which of late Captaine Frobiſher hath begun to enter into, and hath diſcouered it as far as a place now called Meta Incognita, which he himſelf did cal Frobiſhers ſtraights, but yet notwithſtanding it is doubtfull, whether that be a ſtraight to giue paſ-

ſage

ſage to come into the Eaſt Ocean ſea, or South ſea, for any thing that is knowen yet, it may be as well a Bay as otherwiſe, but notwithſtanding whether that be a ſtraight or not, it is poſſible that there may be a paſſage thereabout, betweene the Norther part of America, as betweene Labradore and Groniand, and ſuch lands as lye toward the North Pole.

Wherefore now for to depart from England to goe vnto Cattay by the Northweſt, firſt in making your direction from the weſt part of England, vnto the place called Meta Incognita, the courſe is Weſt Northweſt about 650. leagues, and the Latitude thereof 603. degrees, and on the Starboord is firſt Ireland and Iſeland, and Freeſeland, and on the Larboord ſide, is the Ocean ſea Being at Meta Incognita, you muſt diſcouer thereabouts, where that you may find ſea for to giue you paſſage, and yet if you do find ſea, you muſt hold on your courſe Weſt vntill that you haue paſſed one thouſand, or one thouſand one hundred leagues. For if that you ſhould hold on any Scutherly courſe, you ſhould imbay your ſelfe in the maine land of America, for the extenſion of the backe ſide, or Northſide of America, is not much leſſe then 1000. leagues, before that you ſhall open the way into the Eaſt Ocean ſea, and in this Weſt courſe on the ſtarboord-ſide is the North Pole, and ſuch lands as lye that way, if there be any, on the Larboord ſide, is the main of America, &c. And after that you haue ſailed Weſt 1000. leagues on the North part of America, you may then direct a more southerly courſe, becauſe then you may be open of the Eaſt Ocean ſea, for the moſt part of the beſt Coſmographers lay the opening of that ſea oppoſite vnto vs in our Meridian, and then holding on a ſoutherly courſe, you may hale vnto the great Bay of Quinſay about 400. or 500. leagues. And the Latitude of the North part of the Bay of Quinſay in Cattay is about forty fiue degrees, and on the ſtarboord ſide is the coaſt of Aſia as Mangie and Cattay, and on the Larboord ſide America. And thus much haue I ſaid as touching the third way to goe to Cattay, &c.

The

The fourth way to goe vnto Cattay, not known but supposed, is by the Northeast part, or North part of Russey, about by that way that M. Borrowes begane the discouery about by a land that is called Noua Zembla, which is a countrie or point of aland that extendeth to the Northwards, it is not knowen how farre, and yet it may be possible that it is nauigable that waies if it were attempted.

I will a little vse my discourse concerning the passage that way vnto Cattay. The way and distance vnto the North Cape in Norway is not vnknowne vnto a number of Seamen, the Latitude thereof is 71. degrees, twentie minutes, therefore I doe thinke it best to begin the direction and setting out of the course East, vntill that the doe come to the land of Noua Zembla, and then falling with that place they are to make their discouery as the land wil giue them leaue, and so in this direction it may be possible that they may find a Sea to giue them passage. It may bee also that when they may meete with land, they shall be constrained to goe Northeast, or North Northeast, vntil that the North Pole be raised eighty or eighty fiue Degrees; yet they may hold on their course, vntill such time as they shall be incombred with Ice. for it may be so, that in Latitude of eighty degrees, there shall be no Ice, although that on the Coast of Baccalaos, you may haue Ice, in the latitude of fifty degrees, for no man can tell vntill such time as he hath made experience: and now in this passage vnto the Eastwards from the North Cape vntill that they shall haue the Sea open to come into the Southwards in the Sea of Cattay, it may be about one thousand, or 1200. Leagues, and then in this passage on the Starrboord side is first Norway and Lapia, and the Bay of Saint Nicolas, and the great riuer of Ob & Nova Zembla, and the East part of Asia, and on the Larboord side the North Pole, and those lands that lye that wayes if there bee any: and now in the following of the Coast of the land which may bee Southeast, or South Southeast or South, it may be fiue hundred or 600 leagues

vnto

vnto the Bay of Quinſay in Cattay, and on the Starbord ſide is Aſia and the coaſt of Mangie and Cattay, and on the Larbord ſide the maine land of America, &c.

And furthermore it may be poſſible for to find paſſage for to goe to Cattay, betweene Noua Zembla and the country of Samwetes, through the ſea of Vagates; and this paſſage may be somewhat ſhorter, then for to goe vnto the northwards of Nova Zembla: and then you ſhall haue in this paſſage vpon the ſtarbord ſide, firſt the country of Samwetes, as Picora, and the riuer of Ob & Tartaria, &c. And on the Larbord ſide, Nova Zembla, &c.

And this I do ende as touching the Northeaſt paſſage to goe to attaine vnto Cattay the fourth way, &c.

As touching the fifth way to goe vnto Cattay, it may bee that in my diſcourſe it may ſeeme a meere fooliſhneſſe and a thing vnpoſſible for it to be done, & yet notwithſtanding no man can tell, before that it is put in experience, and yet it is the neereſt way if that it be nauigable, and my meaning is this, for to go directly vnto the Pole if ſo be that there be no land to let the paſſage. Now it is poſſible that ſome will ſay that it is the frozen Zone, but notwithſtanding if that there be not land that way, then it is not frozen, for the great ſalt ſea neuer freezeth; & whereas you doe ſee the great quantity of yce on the coaſt of Labradore and Bacalayas, it is a token that thereabouts is much land towards the North Polewards, and ſo is frozen in ſounds & riuers, and in the breaking vp of the yeere, it doth come driuing out to ſea for in reſpect they do ſeldome ſee any yce at the north cape, nor 100. leagues north off from thence, it is a great token that there is no land towards the Polewards, and before that it hath beene put in proofe it cannot be knowen.

But all the doubts for going vnto the Polewards, are for feare of too much cold, and yet notwithſtanding it may be reaſonable warme right vnder the Pole, for any thing that is knowen vnto the contrary, by the long continuance of the Sunne in Summer, for that in the time of nine weekes, the

Sunne

Sunne is neuer leſſe than 20. degrees aboue the horizon going round about them, ſo that the continuance of the Sunne muſt enforce the ayre to be reaſonable warme, eſpecially if that there be no Ice driuing in the Sea, for it is not ſo cold at Meta Incognita, if that they be not amongſt the Ice, for if that they bee at Sea and not amongſt Ice, then it is very warme, and alſo if that they be aſhore, then it is warme in like manner, ſo that the cold is cauſed by no other meanes, than by the cold breach or ayre that commeth from the Ice. And now to proceede: to goe vnto Cattay, you muſt goe directly North, till that you bee right vnder the Pole, and then goe South to the oppoſite part beyond the Pole, which may be done if that you be not let by any land that lieth in the way. The whole diſtance in this courſe from the riuer of Thames vnto the Bay of Quinſay, is but 1680. leagues, which is a very ſhort way in reſpect of the other. But now it is poſſible that ſome will make argument and ſay, that it is not poſſible for any man to make any direction, or ſet any courſe being directly vnder the Pole, for that it is not known which way that the Compaſſe will ſtand, and alſo in like maner being vnder the Pole, al places is South which way ſoeuer you goe, and alſo the Sunne is equally one height, ſo that you can make no proofe which way is forwards, and which way is backwards: therefore it is to be ſuppoſed, that ſome wil ſay, that it is not poſſible to make any inſtruments to aſſigne any courſe to any place appointed: for truth it is that being vnder the Pole, any place aſſigned is ſouth from vs, what quarter of the world ſoeuer wee are in, and if that the Sea will giue vs paſſage, our courſe is ſouth to goe vnto it, &c. Yet notwithſtanding, I will ſhew vnto you what you ſhall do to make a perfect direction vnto any place appointed being right vnder the Pole, ſo that you ſhall know whether you do go backwards, or forwards, or any other way that you ſhal appoint, ſo that you may ſee the ſun; & that muſt be done thus. Firſt prepare a perfect good clocke

that

that goeth with a spring, the which clocke must be made in that order, that the directer or pointer may goe round in 24. houres, and it must so be marked that it may end 24. houres at noone, and then to begin one. This clocke or Diall being well made, and keping the time truly, when that you doe approach nere to the Pole within one hundred leagues, that is the Latitude of 85. degrées, (for so far the Compasse may serue, and also you may correct the Compasse well enough, for that the Sunne is ten degrées higher on the South part, then it is on the North part) and now being within fiue degrées of the Pole, set your clocke to worke, and let the 24. houre be noone, and then when that you are directly vnder the Pole, loke if that the pointer doth stand vpon the 24. houre, then that part or quarter that the Sun is in, is right backe againe, and if that it point 12 houres, then towards the Sun-wards is right forwards, and if that it point fiue houres, then the part of the world towards the Sun is due West from you, and is one quarter of the earth, that direction will set you right vpon it, and if 18. houres, then towards the Sun doth appoint you that place that is East one quarter of the earth, &c.

And now for to set any course to stirre the shippe vpon to any place appointed, note this for an ensample, I would go directly homewards, and then I will set the Flie of a Compasse before him that shall stirre: and for so much as I come out North, and I must goe home South, I lay the Card or Flie steady before mee, and the South point right with the Ships head or stemme, and so I do set the Clocke by it, now if that the Clock doth point twenty foure houres, for that afore was by noone, then I doe stirre the Shippe right vpon the Sunne, and if the clock doth appoint three houres, then hee that doth stirre must keepe the Sunne vpon the Southwest, and so shall the ship goe that South that shee came from, and if that the clocke doth point fiue houres, then hee that doth stirre must keepe the Sunne vpon the West

point,

point, and if the clocke shew 9. then keepe the Sunne vpon the Northwest. If the Clock doth shew 12, then the Sunne must be on the North point, that is right with the sterne of the ship. And if the clocke doth shew 15. houres, then he that stirreth must keepe the Sunne vpon the Northeast point, if 18. then must he keepe the Sunne on the East point, and if 21. houres, then on the Southeast point, &c. But now if that you would goe directly forwards, then lay the North point right with the shippes head, and when the clocke doth point 12. then stirre right vpon the Sunne, and so in like manner must you stirre by the Sun as I haue afore shewed you by ensample, so that you may see by this clocke or Diall, how you may assigne your selfe to keepe any course into any place in the whole world, you being vnder the pole, and then when that you are departed from the Pole 100. leagues, that is, 5 degrées, then you may vse your Compasse, and correct it by the Sun at your pleasure. And thus much I haue said as touching the passages to goe vnto Cattay, wherefore gentle Reader beare with my rudenes, for that I am so bold to vse my discourse vpon the passage vnto Cattay. And furthermore, some men haue been of that opinion, that when that they are in the East Ocean Sea, that they shall meet with no shipping, as about Cattay and China, &c. But notwithstanding it is a sea wherein there is a huge number of Shippes both great and small, for whereas there is such great trade of Marchandize, & also such a number of Ilands both great & small, and also such a number of commodities in those Ilands, as any man may iudge that it is likely that there is great store of ships, and also Ordnance in their shipping, &c. And it is not vnknowen but that the great Cane of Cattay, is a Prince of great power as well by sea as by land, then iudge you whether that such a Prince of such a force and wealth will not prouide for all things meete for warres. Therefore as soone as they come into those Coasts, they must orderly vse the trade of Merchandize, and not

vse

ble force, &c. Moreouer vpon a time I being with Master Dee at his house at Murclacke, and falling in talke about the discouery to Cattay and the shipping thereabouts: thereupon hee opened a booke and shewed me a note what number of shippes the great Cane had ready at one time to goe vnto sea about his affaires, you would think it incredible, for the number was 15000. which is an huge army by Sea: I replyed againe that it might bee that they were but small things, and yet they might call them ships: and then he turned vnto another place, where the great Cane did send one of his Daughters by Sea, and did appoint 14. of his ships, and the least of the 14 shippes had 250 Mariners, besides all the rest of his Daughters traine, and such Nobles as did accompany her, which could be no small number. Therefore it is most manifest that the Cane is a great Prince of power as well by Sea as by Land.

FINIS.

A Table of the declination of the ſeverall degrees of each ſigne calculated by T. *Hood*, according to the greateſt declination of the Sunne which is now 23 degrees 28 minutes.

Degrees of the Signes	Aries / Libra		Taurus / Scorpio		Gemini / Sagitta		Degrees of the Signes.
	D.	M	D.	M	D.	M.	
0	0	0	11	29	20	10	30
1	0	24	11	50	20	23	29
2	0	47	12	11	20	35	28
3	1	11	12	32	20	47	27
4	1	35	12	52	20	58	26
5	1	59	13	12	21	9	25
6	2	23	13	32	21	20	24
7	2	47	13	52	21	30	23
8	3	10	14	12	21	40	22
9	3	34	14	31	21	49	21
10	3	58	14	50	21	58	20
11	4	21	15	9	22	7	19
12	4	45	15	27	22	15	18
13	5	8	15	45	22	23	17
14	5	32	16	3	22	30	16
15	5	55	16	21	22	37	15
16	6	18	16	39	22	44	14
17	6	41	16	56	22	50	13
18	7	4	17	13	22	56	12
19	7	27	17	29	23	1	11
20	7	50	17	46	23	5	10
21	8	12	18	2	23	10	9
22	8	35	18	17	23	13	8
23	8	57	18	33	23	17	7
24	9	19	18	47	23	20	6
25	9	41	19	2	23	22	5
26	10	3	19	17	23	24	4
27	10	25	19	31	23	26	3
28	10	46	19	44	23	27	2
29	11	8	19	57	23	28	1
30	11	29	20	10	23	28	0
	Virgo / Piſces		Leo / Aquar.		Cancer / Caprico		

FOR ſo much as it is meet and conuenient for a Sea-faring man to be able to find out the declination of the Sun continually, not onely by the helpe of the Table before ſet down according to the day of the moneth, but alſo according to each ſeuerall degree of the ſigne which the Sun poſſeſſeth, therefore I haue here adioyned a Table of declination calculated according to the Suns greateſt declination, which is now eſteemed to be twenty three degrees, twenty eight minutes. The vſe of the which Table is as followeth.

Firſt you muſt ſearch out by the Ephemerides (for that is beſt ſo bee followed by the common ſort) the place of the Sunne, that is to ſay, what ſigne and degree, and minute the Sun poſſeſſeth. Secondly you are to conſider whether the name of the ſigne which the Sun poſſeſſeth be ſet at the toppe, or at the bottome of the Table. If it ſtand at the top, you muſt ſeeke the degree of the ſaid ſigne on the left hand of the Table deſcending downeward. But if the name of the ſigne bee at the bottome of the Table, you muſt ſeeke the degree on the right

hand ascending vpward. Then going on directly from the degree forward either towards the right hand or towards the left as occasion requireth, vntill you come right against the name the signe which the Sun possesseth, you shall find the declination. As for ensample: suppose the place of the Sunne were the 24. degree of Aries. The name of the signe standeth at the toppe of the Table, therefore I seeke out the 24. degree on the left hand, and going on from thence towards the right hand vntill I come right against Aries, I find the declination to bee nine degrees, 19. minuts.

Againe, suppose the place of the Sunne to be the 24. of Cancer: I see the name of that signe to stand at the bottome of the Table, therefore I seeke out the 24. degree on the right hand, and going on from thence toward the left hand, vntill I come right against Cancer, I finde the declination to bee 21. degrees 20 minutes.

Thirdly, in the vse of this Table you are to note whether there be any minutes Adherent and adioyned to the degrees of the signe, which the Sunne possesseth yea or no, as whether the Sunne possesseth precisely the 24. degree of Aries or the 24. degree and the 27. 40. or 50. minute, &c. If there be no minutes ouer and aboue the degrees, then the foresaid Table in such manner as I spake of before, affoordeth declination.

But if there be minutes adioyned to the degrees, then by proportion (otherwise called the rule of three) you must seeke out what declination may belong vnto the saide minutes in this manner.

The first number in the proportion must alwaies be 60. minutes (because we argue from a degree, which is 60 minutes to the parts of a degree, which are the odde minutes Adherent to the whole degree.) The third number must alwaies be the odde minutes adioyning to the degree of the signe which the signe possesseth: for the question is moued concerning them. The middlemost or second number in the

proportion

proportion muſt be the difference of declination betweẽ the declination of the degrée which the Sun poſſeſſeth, and the next degrée immediately following according to the naturall ſucceſſion of the number. The which difference may eaſily be found by the ſubducting of the declination of one degrée out of another The ſecond number being found, and all of them being orderly ſet downe as the rule of three requireth, multiply the third by the ſecond, and diuide the product by the fourth, the quotient affordeth the proportionall part anſwerable to the minutes propounded.

This proportionall part muſt be added to the declination of the degrée aſſigned, if the name of the ſigne ſtand at ỳ top of the Table; but if the name of the ſigne ſtand at the bottom of the Table it muſt be ſubducted, ſo ſhall you find the declination of the degrées and minutes. As for example, ſuppoſe the Sunne poſſeſſe 22. degrées, 22. minutes of Aquarius, what ſhall his declination be? The firſt number in the rule of proportion muſt be 60. minutes, the third muſt be 22. (for they are the odde minutes adioyned to the degrées) and the ſecond number I find thus. The Sunne poſſeſſing the 22. degrée of Aquarius declineth 14. degrées 12. minutes, and poſſeſſing the 23. of Aquarius hee declineth 13. degrées 52. minutes; the one of theſe ſubducted from the other, I find the difference of declination to be 20. minutes, this is the ſecond number in the proportion; whereupon I ſay, if 60. giue 20. what ſhall 22. minutes giue? The quotient according to the rule, is ſeuen (the fraction being neglected as the cuſtome is in theſe matters, becauſe the common ſort careth not for the ſeconds, &c.) And becauſe the name of the ſuppoſed ſigne which the Sunne poſſeſſeth, ſtandeth in the bottome of the Table, therefore I ſubduct the ſaid ſeuen minutes out of the declination belonging to the 22. degrée, and find the declination of the 22. degrée 12. minutes of Aquarius to be 14. degrées fiue minutes.

Againe, ſuppoſe that the Sun poſſeſſeth the 16. degrée 25 minute of Taurus, what ſhall his declination be? The dif-

ference of declination betweene the 16. and the 17. degree of Taurus is 17. minutes; whereupon I say: If the Sunne in going one whole degre, (that is, 60. minutes) doe decline 17. minutes, what shall his declination be in going 25. minutes? The quotient according to the rule is seuen minutes. And because the name of the signe which the Sunne is supposed to possesse standeth in the top of the table, therefore I adde seuen minuts to the 16. degree, 39. minutes, which is the declination of the 16 degree of Taurus, and thereupon inferreth the declination of the 16. degree 25. minutes to be 16. degrees 46. minutes. Thus much briefly concerning the finding out of the declination of any degree which the Sunne possesseth.

FINIS.

The